

Defining Opportunities and Challenges in One Health Agency Management in Sri Lanka

A Thesis Submitted to the

College of Graduate and Postdoctoral Studies

In Partial Fulfillment of the Requirements

For the Degree of Master of Science

In the Department of Animal and Poultry Science

University of Saskatchewan

Saskatoon

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ABSTRACT

Zoonotic infectious diseases continue to impact economic, public, animal, and environmental health globally. Developing countries are at an elevated risk for infectious zoonotic diseases such as bovine tuberculosis, leptospirosis, and rabies, and have significant challenges in addressing these diseases of socio-economic concern. A One Health approach has been increasingly adopted, due to the rise in awareness of the complex interactions of zoonotic diseases at the human-animal-environment interface. In 2011, The Sri Lanka Wildlife Health Centre (SLWHC) partnered with the Canadian Wildlife Health Cooperative (CWHC) with the goal of improving detection and management of disease in Sri Lanka in wildlife as well as at the interface with livestock and human health. My project used an integrative interdisciplinary framework to identify current opportunities and challenges in the SLWHC. After a comprehensive literature review, key participant engagement, and discussion, interview questions were developed, and administered to government wildlife, public health, and agriculture staff. The interviews (n=34) assessed government and academic staff perceptions of existing communication and collaboration channels. This information was used to identify gaps and best practices regarding wildlife disease surveillance, and improvements for the SLWHC, within and between all of the participants and collaborators within the SLWHC. The interviews were conducted in July and August of 2015 and were adapted from the integrative interdisciplinary framework of the policy sciences. A common interest was established between participant groups, the desire to use an interdisciplinary and collaborative approach to combine resources, knowledge, and personnel to detect, reduce, and prevent the incidence of zoonotic disease outbreaks in Sri Lanka. However, important differences were observed between participant groups with regard to potential opportunities to improve the SLWHC. Opportunities for the SLWHC included potential participant groups to be included, diseases and domestic/wildlife species that should be the focus of surveillance, and how communication should take place within and between participant groups. Co-developing an improved governance and collaborative approach for the SLWHC between relevant participants will help better build capacity to effectively detect and manage disease outbreaks that have significant socio-economic importance to the country.

ACKNOWLEDGEMENTS

I would like to thank my advisor Dr. Ryan Brook for his continuous support and advice on this project. I would also like to thank my committee, Drs. Karen Schwean-Lardner, Doug Clark, Craig Stephen, Tim Mutsvangwa, and Fiona Buchanan for all of their recommendations and advice throughout this project. I would also like to thank the Co-Principal Investigators of this project, Drs. Oswin Perera and Fredrick (Ted) Leighton for their continual input and correspondence. Thanks, is also due to Krystal Caldwell, Manoj Akalanka, Preeni Abeynayake, Sampath Lokugalappatti, and Sam Daniel, for their assistance in data collection and organizing logistics while in Sri Lanka. I would also like to thank my husband, parents, and family for all of their endless amount of support and encouragement throughout this process. The funding for this project was through the International Development Research Centre (IDRC) grant.

DEDICATION

For my husband.

Thank you for your unconditional love and encouragement. For always supporting me in all aspects of life, including following me around the world. You are my biggest cheerleader in life, and always believe in me. Thank you for starting this journey through life with me.

For my son.

I didn't know what love was until I held you in my arms. You make me stronger, more determined, and ultimately more fulfilled in life than I could ever imagine. I wish you all the happiness and success in life.

Love you both.

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ABBREVIATIONS

BP	Best practice
CWHC	Canadian Wildlife Health Cooperative
DAFH	Department of Animal Production and Health
DG	Director general
DWC	Department of Wildlife and Conservation
EER	Evolutionary ecological research
EID	Emerging infectious diseases
FVMAS	University of Peradeniya Faculty of Veterinary Medicine and Animal Science
GNI	Gross national income
IDRC	International Development Research Centre
IMRAD	Introduction, methods, results, and discussion
MOH	Ministry of Health
NGO	Non-government organization
OIE	The World Organization for Animal Health
SLWHC	Sri Lanka Wildlife Health Centre
VIO	Veterinary investigation officer
VRI	Veterinary Research Institute
WHHNP	Wildlife Human Health Net Project

CHAPTER 1: GENERAL INTRODUCTION

1.1 Thesis Structure

This thesis is broken down into the three principal dimensions of the integrative interdisciplinary framework of the policy sciences; the social process, decision process, and problem orientation (Clark 2011). These three dimensions are described later in detail. Due to the necessity to fulfill the standard introduction, methods, results, and discussion format (IMRaD), the layout of this thesis is somewhat unconventional. Table 1.1 breaks down the problem orientation section and where each task can be found in the thesis.

The first chapter is a general introduction. Chapter two is a literature review. The third chapter is in the form of a publishable manuscript based on data collected as part of this project. This chapter used the integrative interdisciplinary framework of the policy sciences (Clark 2011), specifically the social process, and problem orientation phase to analyze communication channels regarding wildlife disease surveillance within and between participant groups. The fourth and final chapter is a discussion to highlight key results, themes, and trends found in the data. The final chapter also covers the application of the final task of the problem orientation phase, inventing, evaluating and selecting alternatives (Lasswell 1971; Willard and Norchi 1993; Clark and Brunner 1996; Clark and Wallace 1998; Clark 2001).

The purpose of my thesis project was to determine gaps in knowledge, structure, and communication with participating agencies involved in the Sri Lanka Wildlife Health Centre (SLWHC). Gaps that occur with communication can significantly impact the success of programs that have been put in place to monitor and manage disease (Caldwell 2016). The gaps were determined by using NVivo to identify trends and common themes. These gaps were especially important in the eyes of the four main government participants regarding wildlife, domestic, and livestock disease surveillance associated with the SLWHC. Once the study participants identified these gaps, they were then used to develop a set of best practices to facilitate improved communication and collaboration. The findings from this work were aimed at aiding the development of a sustainable best practice model that the SLWHC can use to optimize and expand existing connections and develop new collaborations.

Participants in the decision processes have their own perceptions, base values, and approaches that they will use during research and analyses that can affect outcomes of the study (Clark 2011). Therefore, in any study, it is important to clarify one's standpoint in order to achieve any desired goals that have been set, and to clarify the human social process (Clark and Wallace 1998, 1999). My personal standpoint for my study is as follows. I have an undergraduate degree in Animal Science and have always been interested in zoonotic diseases. However, my knowledge on zoonotic diseases is more Canadian or American based and focuses more on how zoonotic diseases impact production species and does not include many exotic animals from different countries. I was eager to expand my knowledge on zoonotic diseases around the world and learn how other countries work amongst themselves to combat zoonotic disease outbreaks and the problems that can occur at the human-wildlife-livestock interface. When learning about Sri Lanka and the zoonotic disease problems that they face, I had concerns regarding the level of communication between the participant groups. I was also concerned about the level of desire by all participants I spoke with to try and address their zoonotic disease problems. I had some obstacles to overcome personally in order to do an adequate job of collecting and analyzing my data. One challenge was coming into Sri Lanka to interview predominately male government officials, being a female Canadian researcher. It was also a concern of mine how I would be received as a Canadian coming into Sri Lanka to talk to locals about a very serious issue that they may have thought I lacked a sufficient level of knowledge. I was also worried that they would not be open to talk with me about sensitive information that was crucial to my research. As a Canadian researcher, who is not local to Sri Lanka, I did not have a vested interest in the outcome. I was enthusiastic to help out in any way that I could. Throughout the research process, it was important to continue to revisit the goals and objectives I had set for my project and myself throughout my master's project.

Specific research objectives were to:

- i. Determine the existing communication channels and perceived adequacy of communication regarding wildlife, domestic, and livestock disease surveillance within and between the participants of the SLWHC.
- ii. Characterize self-identified gaps in communication within and between the participants of the SLWHC.

- iii. Determine best practices that can help better achieve goals and common interests of participants.

In order to achieve my research objectives, it was critical to keep my standpoint in mind while I interviewed participants (Bourke 2014).

Table 1.1 An overview of the five intellectual tasks of the problem orientation and questions (Clark 2011) specific to this thesis. Due to the introduction, methods, results, and discussion (IMRaD) format of this thesis, locations of each task are also provided (adapted from Lasswell 1971; Clark and Brewer 2000).

Tasks	Questions to Ask	Location in Thesis
Clarifying goals	What goals, both biological and social, do participants share?	3.4. Results
Describing trends	What are key trends that are present throughout the history of the SLWHC? Have events moved toward or away from participant goals?	3.4. Results
Analyzing conditioning factors	What factors, relationships between participants and conditioning factors influenced/created these trends? What quantitative and qualitative models could be useful to explain these trends?	3.4. Results
Projecting developments	When taking into account trends and conditioning factors, what is predicted to happen in the future? Out of multiple predicted scenarios, which is most likely to occur? Will this future going to help achieve goals?	4.0. Discussion
Inventing, evaluating and selecting alternatives	If current trends are not moving toward the goal, then problems already exist, and alternatives must be determined. What other factors (policies, rules, norms, institutional structures), might help move toward the goal?	4.0. Discussion

1.2 Background

Developing countries having both high human densities and high biodiversity in tropical and sub-tropical climates, are the most susceptible to disease transmission at the human-wildlife-livestock interface (Valeix et al. 2011). A developing country can be classified based on their level of development by measuring gross national income (GNI) per capita (United Nations Department for Economic and Social Affairs 2019). These warm climates are frequently hotspots for the emergence and re-emergence of infectious diseases with the potential for global dispersal (Valeix et al. 2011). Emerging infectious diseases can have important socio-economic consequences for human health, wildlife conservation, and livestock production. Developing countries that are comprised of mostly low or middle-income people have significant challenges in preventing new diseases and managing existing diseases (Valeix et al. 2011). This is because they often lack sufficient economic and human resources and internal infrastructure. A One Health approach “demonstrates closer cooperation between human and animal health resulting in benefits that are not achieved through the two medicines working independently” (Narro et al. 2012). In many developing countries, a One Health approach is not used between veterinary and human medicine in the surveillance of zoonotic diseases (Narro et al. 2012). Some developing countries lack adequate disease surveillance programs, diagnostic capacity, health infrastructure, funds, support from outside organizations, and institutional capacity (Narro et al. 2012; Zinsstag et al. 2009).

In developing countries, the incidence of infectious diseases due to a wide array of pathogens is at least ten-fold higher than higher income countries (McDermott and Grace 2012; McDermott et al. 2013). Zoonotic pathogens, diseases that originate in animals and can be transferred to humans and vice versa, have been estimated to be responsible for 60% of emerging infectious diseases (EID), while 72% of these EID outbreaks are due to wildlife-borne pathogens that originated in wildlife (Canada’s National Wildlife Disease Strategy 2004; Jones et al. 2008; Taylor et al. 2001; Woolhouse and Gowtage-Sequeria 2005). The impact that emerging and endemic zoonotic diseases have globally on human and animal populations encourage their control and prevention to be the starting point in collaboration between the human and animal health sectors (Rist et al. 2014). In order to achieve an effective zoonotic disease surveillance and management program there needs to be frequent and effective communication between participants (Decker et al. 2011; Halliday et al. 2012). This includes private veterinary

practitioners, public health officials, wildlife managers, the general public, and any other relevant participants (Decker et al. 2011; Halliday et al. 2012).

Collaborative governance is being used worldwide in various ways to respond to wildlife disease (Decker et al. 2012). In order to manage complicated health issues effective collaboration and sharing of information needs to take place between a broad group of practitioners (Anholt et al. 2012). In the case of the SLWHC, a collaborative, multisectoral, One Health approach was selected as an essential best practice to combat zoonotic disease occurrence. When adapting a multisectoral One Health approach, it is crucial that all relevant participants are acknowledged and included in discussions as early as possible in order to include all perspectives on an issue (Taking a Multisectoral, One Health Approach: A Tripartite Guide to Addressing Zoonotic Diseases in Countries 2019).

Some case studies highlight the importance of good communication for collaborative approaches to zoonotic disease control. In Northeastern Michigan in 1994, participants came together to combat the first outbreak of bovine tuberculosis in free-ranging deer that were transmitting the disease to livestock (Decker et al. 2012). To achieve optimal communication among the groups, new channels of communication, and collaboration had to be created (Decker et al. 2012). Coordination among the participants was critical to ensure policies and practices were established that were beneficial to both humans and animals during the eradication of the disease (Decker et al. 2012). This collaboration between participants is an example of the coordination that is necessary when dealing with wildlife disease and creating a network of effective multi-level governance (Decker et al. 2012). For example, in Riding Mountain National Park, the tuberculosis (TB) Stakeholders Advisory Committee was created in order to increase cooperation and communication in regard to the TB problem (Brook and McLachlan 2006). However more collaboration and discussions with producers and the government were seen to be needed in order to make a real difference (Brook and McLachlan 2006). Collaborative governance allows participants involved to pool resources, knowledge and influence outside agencies (Decker et al. 2012). *“The need for collaborative governance is greatest when and where stakes related to wildlife are greatest”* (Decker et al. 2012, p. 25).

In March of 2013, the Canadian Wildlife Health Cooperative (CWHC) and the Centre for Coastal Health (Nanaimo) joined with the Sri Lanka Wildlife Health Centre (SLWHC) in an effort to improve national and local scale wildlife health monitoring and management (Sri Lanka-

a Renewed Partnership in Wildlife Health 2013). With funding obtained from Canada's International Development Research Centre (IDRC), the three groups collaborated on a 4-year-long research and capacity building program (Sri Lanka- a Renewed Partnership in Wildlife Health 2013). The SLWHC aimed to develop an ecological system to review and control health and disease related concerns of wildlife.

Phase 1 of the Wildlife-Human Health Net Project (WHHNP) (2013-2017) consisted of Rapid Rural Appraisals, in order to establish a starting point for the project. This was a sub-project to study sociology under the WHHNP. The main objective of this sub-project was to determine strategies that could be implemented to include local communities, to determine research priorities, collect data, and ultimately benefit from the findings regarding wildlife health and disease. Interviews were conducted by team staff from the University of Peradeniya Veterinary Medicine and Animal Science faculty (FVMAS) to determine general knowledge about wildlife disease in Sri Lanka by interviewing key informants from Panahaduwa and Galpaya villages, in the vicinity of Uda-walawe National Park (Workshops with Government Officials from the Wildlife, Livestock, Human Health, and Administrative Sectors, n.d.).

Following phase 1, two workshops were held; the first one was in Ratnapura district bordering the Uda-Walawe National Park. The second workshop took place in Mahiyanganaya, Ampara and Matale districts, areas bordering the Wasgamuwa and Maduruoya National Parks. Participants who took place in the workshop were from the wildlife, livestock, public health, and administrative sectors. The participants who took part in the interviews for the wildlife sector in both workshop 1 and 2 included: Director of Wildlife Health, or nominee, Assistant Director of Wildlife for the Region, wildlife veterinarian for the region, park warden of Uda-Walawe National Park, range officers, range assistants, and wildlife guards (Workshops with Government Officials from the Wildlife, Livestock, Human Health, and Administrative Sectors, n.d.).

The following zoonotic diseases were reported in wildlife, in the two years prior to the 2013 survey in the Ratnapura district and the areas bordering the Uda-Walawe National Park: leptospirosis, typhus, rabies, cutaneous larva migrans, leishmaniasis, and Japanese encephalitis. A key gap observed by the team staff from FVMAS was that the disease surveillance system at the time relied on separate groups who are responsible for the surveillance and investigation of disease. Researchers suggested that those directly involved in disease surveillance should be integrated to work more cohesively together. From the interviews conducted in the first workshop

there was a perceived lack of knowledge of interviewees about the severity of the zoonotic disease problem within Sri Lanka. In this workshop, the Department of Animal Production and Health (DAPH) was the only participant group that had a clear understanding regarding the severity of zoonotic disease occurrences and transmission by wildlife, domestic animals, and the public (Workshops with Government Officials from the Wildlife, Livestock, Human Health, and Administrative Sectors, n.d.).

The following zoonotic diseases were reported in Sri Lanka, in the two years prior to the 2013 survey in the Mahiyanganaya, Ampara & Matale Districts and the areas bordering the Wasgamuwa and Maduruoya National Park: rabies, brucellosis, scabies, leptospirosis, typhus, mange, ticks, udder impetigo, bovine tuberculosis (TB), and leishmaniasis. In this workshop, the DAPH and wildlife sector were the only participant groups to provide knowledge about the severity of the issue at hand (Workshops with Government Officials from the Wildlife, Livestock, Human Health, and Administrative Sectors, n.d.).

The central pillar of the SLWHC was to create a small cohort of wildlife health specialists in Sri Lanka, competent in both research and disciplinary knowledge and schooled particularly in cross-disciplinary and cross-sectoral ways of thinking, solving problem, delivering services, and mobilizing wildlife health knowledge to serve the sectors of those who came together to develop the SLWHC (Sri Lanka- a Renewed Partnership in Wildlife Health 2013).

The need for animal based surveillance has increased globally, due to the need for early detection of animal disease as an emerging disease prevention strategy, as well as the consideration of disease outbreaks in relation to human health (Sawford 2012). The scope of the SLWHC's research included disease interactions between people, wildlife, and livestock, as well as trying to develop a best practice model in an attempt to bridge the gap between universities, government and non-government groups, and the surrounding communities to increase public knowledge and awareness about the severity of zoonotic diseases within the country (Sri Lanka- a Renewed Partnership in Wildlife Health 2013). The collaboration of participants who play a crucial role in health at the human-animal-environment interface is essential to address zoonotic disease issues (Taking a Multisectoral, One Health Approach: A Tripartite Guide to Addressing Zoonotic Diseases in Countries 2019). In order to enhance communication about zoonotic diseases, wildlife professionals, and other relevant participants, need to actively communicate with public health officials to frame an effective message about zoonotic diseases (Decker et al.

2011). The SLWHC needs to continue to build on their collaborative, interdisciplinary relationships they have formed in order to reduce gaps in their communication channels and achieve common goals and interests they have established for themselves.

CHAPTER 2: LITERATURE REVIEW

2.1 Human-Wildlife Conflict

Conflicts at the human-wildlife interface are growing in frequency and escalating in social and economic impacts globally (Madden 2004). Human-wildlife conflict has important implications for human health, welfare, and safety, and for ecosystem health and biodiversity (Nyhus 2016). This increase in conflicts and impacts is due to the increasing overlap between humans and wildlife competing for space, resources, and habitat (Madden 2004; Inskip and Zimmermann 2009). Injuries and death can occur when humans are directly attacked by animals, or by the transmission of a zoonotic disease or parasite (Conover 2002). Conflict can also occur when the public attempts to resolve human-wildlife problems, this could be by killing the animal or retaliating against wildlife conservation authorities (Madden 2004). In most developing countries, the economic investment allocated to veterinary and health services is limited, which is in part responsible for limited operational capacity and sometimes incomplete surveillance methods needed to monitor and manage zoonotic disease conflicts (McDermott et al. 2013).

Roughly 43% of emerging pathogens and human parasites have been estimated to arise in wildlife (Jones et al. 2008; Joseph et al. 2013). Diseases that have originated in wild animals, or for which wild animals are reservoirs, have become an increasing global issue, as they have a remarkable impact on biodiversity, agricultural production, economies, and human health (Canada's National Wildlife Disease Strategy 2004). When people and animals share an environment that increases the chance of contact, zoonotic diseases and other foodborne diseases associated with animals become increasingly important (McDermott et al. 2013). Infectious diseases can also impact wildlife behaviour, therefore increasing the risk of conflict (Nyhus 2016).

An interdisciplinary approach, one that combines perspectives from ecological, health, and social sciences, should be taken in order to bridge the gap between conservation, health, and the social aspect in order to resolve the conflict effectively (Barua et al. 2013). This could include the incorporation of epidemiologists, social workers, health economists (Barua et al. 2013), veterinarians, producers, and the public. The occurrence of human-wildlife conflicts is likely to increase as human populations increase and spread further into wildlife habitat (Nyhus 2016), unless immediate preventative action and management is taken to decrease the frequency and

impacts of these conflicts. Recently more interdisciplinary approaches have emerged, such as the concept of One Health. The One Health approach was developed in order to identify multidisciplinary and interdisciplinary problems that occur when combining human, animal, and environmental health when trying to decrease the potential threat of zoonotic diseases (Buttke et al. 2015).

2.2 Interdisciplinary Collaboration on Wildlife Disease Strategies

Effective collaboration and information sharing between the medical, veterinary, and environmental sciences is crucial in the prediction, prevention, and response to emerging zoonotic diseases (Anholt et al. 2012). *“The term collaboration conveys the idea of sharing and implies collective action oriented toward a common goal, in a spirit of harmony and trust, particularly in the context of health professionals”* (D’Amour et al. 2005, p. 116). The two elements that should be constant when teams are collaborating are: developing a common action that helps address participant’s needs, and secondly, the development of an integrated team environment that takes into account all participant’s perspectives, and where participants show trust and respect for one another (D’Amour et al. 2005). In order to start to have effective collaboration in regards to zoonotic disease issues, there needs to be a strong interdisciplinary foundation built between wildlife veterinarians, biologists, and managers from which a solid relationship is built with public health officials (Decker et al. 2011). Some other participants who have a vested interest in wildlife health research and management and could be included are: government officials, local communities directly and indirectly affected by wildlife disease, researchers, scholars, and human and animal health officials (Canada’s National Wildlife Disease Strategy 2004).

The importance of wildlife disease research has increased recently, due to the impact of disease on wildlife, human health, and conservation biology (Wobeser 2007). The wildlife health research community has done a great job in identifying and defining wildlife disease threats, however when it comes to the development of disease management options and prevention tools, that process is delayed (Sleeman et al. 2017). McDermott et al. (2013) warned that simply reproducing past successful disease eradication strategies from developed countries will most likely not work in low income countries. Depending on the country and circumstances, individual approaches will have to be developed that are specific to their own situation and areas in need of

improvement. Leighton et al. (2012) identified three basic elements that are required in order for a national program in wildlife health management to be successful. These include prevention (gathering and assessing information to decrease risks), early detection (continuous wildlife surveillance), and response and recovery (developing ways to better manage wildlife disease and planning preemptive responses). Moreover, in addition to these three basic elements, Leighton et al. (2012) described two additional required components. Research capacity needs to focus on key information which is applicable to an effective management strategy and an encouraging administrative and political environment with sustainable governance structure, and financial backing is also needed (Leighton et al. 2012). In many countries there is limited capacity for disease control and eradication (McDermott et al. 2013). In order for dedicated efforts aimed at disease control to be realistic and useful there needs to be more targeted monitoring and mitigation efforts implemented in all countries, especially those that are of low and middle income (McDermott et al. 2013).

In Sri Lanka there are outbreaks of disease in wildlife, however few are actually identified and investigated (Valeix et al. 2011). Many of the disease outbreaks that do occur are significant to both people and animals, but their occurrence is unknown (Valeix et al. 2011). Some of the diseases that are most common and of significant risk to human and animal health to Sri Lanka include: rabies, bovine tuberculosis, Newcastle disease, brucellosis, foot and mouth disease, fowl cholera, leptospirosis, and haemorrhagic septicaemia (Valeix et al. 2011). In order for the Sri Lanka Wildlife Health Centre (SLWHC) to continue increasing its capacity in support of research, education, monitoring, and mitigation efforts, it could expand on its existing work and collaboration with veterinarians, public health officials, and park and livestock personnel and increase their current knowledge about wildlife disease, as well as physical number of experts (Valeix et al. 2011).

2.3 One Health

The term One Health has emerged in recent decades, however there is not one single agreed upon definition. One Health was defined by the One Health International Conference (2014) as “*a worldwide strategy for expanding interdisciplinary collaborations and communications in all aspects of health care for humans, animals and the environment*” (One Health International Conference 2014). The One Health Initiative’s vision statement, as stated on

their website, indicates that they are devoted to the enhancement of both humans and animals by assimilating human and veterinary medicine with environmental science (One Health Initiative n.d.). The Sri Lanka One Health Hub was put in place to help connect organizations, individuals and groups who are interested in Sri Lanka's One Health activities, through networking and coordination (One Health Network 2012). Its members are professionals in either the human, animal, or wildlife health fields (One Health Network 2012). The Sri Lanka One Health Hub was founded by key government organizations including: the Epidemiology unit of Sri Lanka, within the Department of Health Services in the Ministry of Health and the Division of Animal Health in the Department of Animal Production and Health within the Ministry of Livestock and Rural Community Development (One Health Network 2012).

A One Health approach is one that bridges the gap between human and animal health. This will result in benefits that are advantageous to both human and animal medicine working cooperatively, instead of independently (Narrod et al. 2012). Risk-management frameworks that are 'One Health' based will have broad implications for both the public and animal health sectors, due to the rising importance of emerging and endemic zoonotic diseases worldwide (McDermott et al. 2013). By using the concept of One Health, while collaborating with other wildlife health centres, using the aid of technological advances, and better surveillance techniques, there is great potential for improved infectious disease control (McDermott et al. 2013) and thus identification of optimal practices.

2.4 Best Practices

A science-based and community engaged disease monitoring and management strategy is critical to mitigate the impact of wildlife disease (Crozier and Schulte-Hostedde 2014). Therefore, vigilant attention should be taken to look out for "*potential evolutionary and ecological mechanisms*", which can lead to more desirable outcomes (Crozier and Schulte-Hostedde 2014, p. 788). Best practices can include a superior process, technique, or practice, which is used to achieve consistent improvements in quality over time, thus creating a benchmark of evidence based practice that can be used in the future (Australian Health Organisations Taking Up Best Practice Challenge 1996; Carnegie 1994; Perleth et al. 2001). "Best practices (BP) are prescriptions for improving (on) the *status quo*" (Clark et al. 2014). In order for a successful disease management program to be developed and implemented by a wildlife health centre, a

series of best practices can be assessed and put in place. When developing a wildlife disease management approach, long-term and short-term consequences should be assessed (Crozier and Schulte-Hostedde 2014). Any benefits and impacts, such as an integrated, long-term approach can help to increase the sustainability (Crozier and Schulte-Hostedde 2014). If these long-term consequences are assessed this will encourage optimal management practices that have a low negative impact on wildlife species, but provide maximum benefit to all participant groups involved (Crozier and Schulte-Hostedde 2014), as well as wildlife.

A best practice that is important for addressing zoonotic diseases at the human-animal-environment interface is to have the “*support and agreement for taking a multisectoral, One Health approach at the highest possible level of national government*” in order to increase the sustainability of zoonotic disease activities (Taking a Multisectoral, One Health Approach: A Tripartite Guide to Addressing Zoonotic Diseases in Countries 2019, p. 21). In order for best practices to be successful, there needs to be a clear set of goals and objectives, without them it is hard to recognize the important factors that are driving the system, therefore making it hard to give recommendations on how to use that knowledge to then make improvements or determine the effectiveness of current best practices (Hohl and Clark 2010). As an example, the Pennsylvania Game Commission and the Pennsylvania Bureau of Forestry had differing goals and objectives when it came to managing public forests for wildlife; one wanted to maintain whitetail deer populations, while the other wanted to see a decline in the population (Hohl and Clark 2010). Madden (2004) held a workshop with thirty participants from various institutions, backgrounds and locations, about human-wildlife conflict that looked at the challenges, as well as the potential to create a “toolbox” of best practices that identifies the critical needs and gaps associated with human-wildlife conflicts. These best practices could then serve as a baseline that participants could use to help mitigate and prevent human-wildlife conflicts (Madden 2004). Best practices allow for the ability to communicate possible alternatives that improve policy or management outcomes (Clark et al. 2014).

2.5 The Policy Sciences Framework as it Relates to the Human-Animal-Environmental Interface

Policy is focused on problem solving, usually involving some technical content (Clark 2011). Policy is also an attempted solution which is developed in order to solve a problem, but in order to be useful it should be successfully implemented (Clark 1992; Clark 2011). Policy

processes focus on addressing an issue or problem that is at hand, and include people and programs to combat that issue (Tefera and Kramarczuk Voulgaris 2016). The field of the policy sciences is comprised of unifying ideas or tools that can be used for outlining thoughts and process, as well as providing a guide for analysis, interpretation and a solution for any problem (Lasswell 1968). Instead of the majority of a researcher's focus being on scientific analysis or prediction, a policy researcher may integrate human perspectives and values into the decision-making process. The six phases of the decision process (Brewer 1973; Clark 2011) allow observers, analysts, or participants to comprehend what is happening in a policy process and see where improvements could be made (Table 2.1). Analyzing decision processes allows for the development of targeted interventions that can improve the quality of specific decision functions (Clark 2011).

Table 2.1. Potential benefits from the six functional components of a decision process (adapted from Brewer 1973).

Decision functions in the policy process	Possible benefits and outcomes
Initiation/invention	<ul style="list-style-type: none"> -Creative thinking about a problem -Prototypical design -Crude hypothesis testing -Preliminary investigation of concepts or claims
Estimation	<ul style="list-style-type: none"> -Scientific examination of likely impacts and outcomes of a set of plausible options -Normative/evaluative examination of likely human impacts of plausible options -Development of outlines of a complex program -Thorough evaluation of concepts or claims -Establishment of a first approximation of performance indicators -Detailed estimation of critical parameters
Selection	<ul style="list-style-type: none"> -Focusing debate on the actual issues -Allowance for cleaner, less hedged, or compromised options to be selected -Choice among program designs -Reduction of uncertainty about various options
Implementation	<ul style="list-style-type: none"> -Development of specific, difficult pieces of a program -Development of a complex program giving due respect to existing institutional and incentive structures -Minimization of implementation costs -Establishment of performance expectations based on estimates of critical parameters for selection option -Reduction in unexpected and unwanted surprises from program implementation
Evaluation	<ul style="list-style-type: none"> -Comparison of estimated performance levels with those actually attained -Reconciliation of expected institutional responses with those actually observed
Termination	<ul style="list-style-type: none"> -Predetermination of whether the problem is chronic, recurring or resolvable -Generation of information about new problems, some of which may require experimental treatment

The integrative interdisciplinary framework of the policy sciences is one subset of policy scholarship as a whole, but it is commonly used by scientists when dealing with issues such as governance at the human-animal-environmental interface (Clark 2011). It serves as a tool that allows researchers to organize thoughts, knowledge, and problem solving efforts (Clark 2011). The integrative interdisciplinary framework has been used in the analysis of the management of multiple species, such as mountain lions (Mattson 2014), grizzly bears (Clark and Slocombe 2011; Oppenheimer and Richie 2014), polar bears (Clark et al. 2008), wolves (Pym et al. 2014; Watters et al. 2014), and the appraisal of threatened species in Australia (Clark 1996). Clark et al. (2008), used the integrative interdisciplinary framework in polar bear conservation to give a comprehensive picture of the overall situation, analyze current management strategies and the ability to adapt to future stressors, and provide suggestions of ways to incorporate common goals of participants. In the case of grizzly bear conservation in Banff, the integrative interdisciplinary framework was used to help guide participants through a broad and methodical analysis of problems that occur when dealing with social, political, and ecological factors related to conservation efforts (Rutherford et al. 2009). By helping participants define their standpoints and common goals, they then were directed through the five tasks of the problem orientation, followed by the social and decision process (Rutherford et al. 2009). The integrative interdisciplinary framework allows participants to account for a wide diversity of aspects that encompass the problem, including those which may have otherwise been overlooked (Rutherford et al. 2009).

2.6 The Integrative Interdisciplinary Framework of the Policy Sciences

Clark (2011) created the integrative interdisciplinary framework that can be applied as a general model to map out policy processes. The interdisciplinary framework has not been widely used in interdisciplinary problems specifically focused on wildlife disease issues. However, the integrative interdisciplinary framework has been widely used for conservation problems that involve complex systems, described by its users as “*the most comprehensive and yet sufficiently detailed framework that we have encountered for the purpose*” (Lasswell 1971; Lasswell and McDougal 1992; Clark 2008; Clark 2011; Clark et al. 2011; Rutherford and Clark 2014, p. 375). The three main dimensions of the framework were selected to help our research explore the interdisciplinary social and communication issues that are present in the SLWHC. One of the

benefits of using this particular framework is that it acts as a constant frame of reference for the researcher, especially for those trained in biology, physiology, or ecology, and allows the researcher to have a purposeful understanding of policy processes (Clark 2011). This framework can aid in the organization of thoughts and answers obtained from potential interview subjects (Clark 2011). This framework, used as an organization tool, can support problem formation and understanding its true complexity (Clark 2011).

The integrative interdisciplinary framework consists of 3 dimensions: the social process, decision process, and problem orientation (Clark 2011). The social process involves participants, perspectives, situations, base values, strategies, outcomes and effects, and values (Clark 2011). The social process is used to interpret how people behave and interact (Clark 2011). The decision process is separated into six functions: initiation, estimation, selection, implementation, evaluation, and termination (Brewer 1973). The final dimension is problem orientation, which consists of the aggregate analytical tasks of clarifying goals, describing trends, analyzing conditioning factors, projecting developments, and inventing, evaluating and selecting alternatives (Clark 2011). Lasswell (1971) noted that a distinct challenge for professionals, who are trying to focus on policy, is to find a way to map both the social and decision processes in a way that is applicable to the five tasks of problem orientation, shown in Table 1.1. In the problem orientation phase, it is essential to fully understand and analyze the problem before a solution is suggested and implemented.

“The integrative interdisciplinary framework is primarily an effort to systematize the major variables with which social scientists grapple in all political and policy inquiry” (Clark 2011). This framework helps establish a stable frame of reference which can be applied to any case at hand (Clark 2011). It should be noted that the integrative interdisciplinary framework outlines the principles of critical thinking (Clark 2011). When applying the policy process to polar bear conservation issues, Clark et al. (2008) found that no participants’ desired outcomes were being met and were able to identify potential interventions to ameliorate the situation. The policy process allows researchers to see if the common interests of participants are being met, and if not, develop a new strategy to achieve the desired outcome. Table 1.1 is an adaptation of Clark’s (2011) integrative interdisciplinary framework and provides some example questions that can be asked in order to fulfill the tasks associated with the integrative interdisciplinary framework.

Influencing the policy process can happen in a number of different ways, such as changing goals, adopting a new policy, and providing small changes to institutional arrangements in existing policies (Weible et al. 2012). The success of any study can be determined if a common goal/interest can be reached by the different participating participant groups. Cromley (2002) has established three criteria to determine whether a policy process is functioning to clarify and secure the common interest of its participants: is it inclusive and open to broad participation; does it meet the valid expectations of participants; and when the policy is applied or being tested on a practical level is it responsive and adaptable in achieving the goals as the context changes? If Cromley's three criteria are met, the policy process is producing common-interest outcomes. In order for a successful policy process or best practice model to be developed and implemented by the SLWHC, common interests were established in order to identify desired outcome and a path to achieving it. It may be beneficial to ask each individual who represents a participant group what they think the other participant's views or opinions may be. This may help establish common interests or identify strong differences in interests between participant groups (Clark 2011). For a policy to be effective, the issue at hand needs to be carefully assessed from all relevant angles and relevant participant's viewpoints on the issue.

2.7 Participant Communication

Effective communication is critical for population health management. It can be in the form of written or verbal, it can be done by using various communication channels such as health professionals (i.e. veterinarians or physicians), family, friends, mass media, internet, or forms of advertising (Cipolla et al. 2015). Other forms of communication can include focus groups (Lunt and Livingstone 1996), or social media such as Facebook (Ungerman and Myslivcová 2014), Twitter, and YouTube. Creating effective communication channels depends on what type of media is being used, participant characteristics, and task arrangement (Huang et al. 2005). If good communication is established, it can improve participant commitment to their organization, and is a fundamental component of good management throughout the levels (Wood 1999). Unique strategies that rely on intersectoral cooperation between the veterinary and public health sectors and the media are important for One Health, as today there are many activities that involve control of emerging zoonotic diseases, that are in jeopardy due to the lack of trustworthy communication with media outlets (Tabbaa 2010).

Communication between the public, wildlife health, domestic animal health, and public health professionals with regard to wildlife related diseases is a major challenge to date (Decker et al. 2011). Wildlife professionals, such as biologists, managers, and veterinarians, play a crucial role in communication with the public, however working with public health professionals to provide a clear and reliable message is crucial for zoonotic disease management (Decker et al. 2011). Health communication is becoming increasingly important, and can be defined as “*the study of how health information is generated and disseminated and how that information affects individuals, community groups, institutions, and public policy*” (Cipolla et al. 2015, p.136; Harvard School of Public Health 2019). Veterinarian communication skills should be improved, as human and animal health are intertwined, the same way health communication is with the human and veterinary sectors (Cipolla et al. 2015).

Interdisciplinary collaboration between wildlife and public health professionals can help frame problems associated with wildlife disease in such a way to it can be best received by the public (Decker et al. 2011). When public health officials communicate zoonotic disease information to the public without context provided by wildlife health professionals, negative public perception of wildlife can emerge (Decker et al. 2011). Educating the public with regard to zoonotic disease is a necessary step to establish an effective disease control program (Ogdee et al. 2016; Hasanov et al. 2018). Incorporating “citizen science” into wildlife disease surveillance, by collecting reports of wildlife morbidity and mortality, can help increase awareness of wildlife disease incidents (Lawson et al. 2015).

The need for interdisciplinary communication channels is increasingly urgent (Callaos and Horne 2013), especially between different participant groups or external participants to combat wildlife disease problems that pose threats to the wildlife, livestock, domestic animal, and human sectors. There are two important purposes that communication between public health agencies and external participant groups serve (Longest and Rohrer 2005). First, inter-agency communication allows agencies to acquire resources that are crucial in sustaining themselves, as well as to adapt to changing environmental situations (Longest and Rohrer 2005). Second, communication between agencies and external participant groups is crucial in order for agencies or participant groups to carry out their common goals or core missions, such as enhancing public health, (Longest and Rohrer 2005). Agencies and participant groups can also learn from each other as they work together on joint tasks (Mirić 2014; Williams 2017).

Effective communication can be inhibited by interpersonal or personality barriers between agencies and participant groups (Longest and Rohrer 2005). Constant re-evaluation of barriers should take place to minimize the potential interference of information flow that could occur as a result. Including the right participant groups or agencies in the proper networks, and guaranteeing continual communication flow between participant groups leaders can help to avoid a potential management crisis (Rosenthal and Kouzmin 1997; Wise 2006; Williams 2017). When teams of professionals clearly define a common goal it helps increase performance and effort by team members, therefore encouraging cooperation and communication (Guzzo and Dickson 1996). Internal (communication within a participant group) and external communication (communication between participant groups) are both important to enhance interdisciplinary team performance (Ancona and Caldwell 1992). Regular and effective communication is crucial with interdisciplinary teams so participants can establish their roles, individual tasks, common goals, and expected outcomes (Stokols et al. 2008). This will also enable them to learn about their fellow participants, appreciate and respect differing points of views, and ultimately breakdown any interdisciplinary boundaries to create conceptual frameworks that will help solve any problems at hand (Stokols et al. 2008).

CHAPTER 3: DEFINING OPPORTUNITIES AND CHALLENGES IN WILDLIFE DISEASE SURVEILLANCE FOR THE SRI LANKA WILDLIFE HEALTH CENTRE

3.1 Introduction

Increased worldwide wildlife disease surveillance and research addressing the epidemiology and the control of emerging wildlife and zoonotic diseases is essential (Ancona and Caldwell 1992). The environment that assists in the emergence of diseases differs depending on the country, the disease, and the host species, but the challenges that are faced for managing the disease are similar (Smolinski et al. 2003; Jebara 2004; Jones et al. 2008; Morens and Fauci 2013; Sleeman et al. 2017). The quality and capacity of surveillance differs greatly depending on the country (Jebara 2004; Kuiken et al. 2005). Each country has their own set of priorities with variable access to resources and infrastructure that are needed to address wildlife disease (Jebara 2004).

There is a growing desire by many agencies and participants to increase the integration of wild and domestic animal and human pathogen surveillance systems both at national, international, and global levels (Kuiken et al. 2005; Woods et al. 2019). Disease surveillance in domestic animals is primarily focused on pathogens with a known economic impact and/or significant public health risk (Kuiken et al. 2005). Sri Lanka continues to be challenged with a variety of wildlife-associated diseases of socio-economic importance. Cattle, for example, are a reservoir of human leptospirosis, a zoonotic disease endemic to Sri Lanka. Due to the large number of cattle and buffalo raised in Sri Lanka for meat and dairy sources, the negative impacts that carriers of the disease pose have a significant impact on public and animal health (Gamage et al. 2014). Leptospirosis has a massive impact globally, with 1 million new infections and an estimated 59,000 deaths per year (Costa et al. 2015). Rabies has been controlled or eradicated in most developed countries, but is still endemic to Sri Lanka (Hettiarachchi et al. 2013). Worldwide, one person dies from rabies every 10 minutes, and in Sri Lanka there are still 40-50 deaths annually from the disease (Hettiarachchi et al. 2013). In Sri Lanka there are many domestic and wild animals that are hosts to the rabies virus, thus making it difficult to eradicate and control the disease (Pushpakumara Don Bamunusinghage et al. 2019). Foot and mouth disease are a prominent disease that has severe economic effects on the Sri Lanka cattle industry

(Valeix et al. 2011). Another zoonotic disease that affects the island is bovine tuberculosis (TB). In 2016 there was approximately 147,000 new zoonotic TB cases, with 12,500 people dying from the disease, with the largest number of human cases found in Africa and then Asia (Cousins 2018). The presence of TB in wildlife is poorly understood in Sri Lanka. The effects of all these diseases have on animal and public health, as well as the implications the diseases have for the economy are very significant (Davies 2006). Therefore, it is critically important that the incidence of these infectious and zoonotic diseases be greatly reduced or eliminated.

Any country, regardless of their socio-economic status, is susceptible to the emergence of zoonotic diseases (Jebara 2004). Each country differs at least somewhat in terms of how participants participate (or fail to participate) in managing and controlling zoonotic disease outbreaks (Jebara 2004). The Sri Lanka Wildlife Health Centre (SLWHC) brought together four main government participant groups, the Department of Wildlife and Conservation (DWC), the Ministry of Health (MOH), the Department of Animal Production and Health (DAPH), and the University of Peradeniya Faculty of Veterinary Medicine and Animal Science (FVMAS). These groups were brought together to pool resources and knowledge to combat wildlife disease within the country, share data, and provide training and information to health professionals in all of these sectors. An interagency, collaborative approach can help bring participants together in terms of expertise, infrastructure (laboratories, research institutes, faculties of veterinary medicine), and logistics available to different participants (communication tools, vehicles, staff time, and equipment) in order to develop protocols and policies in case of an outbreak or crisis (Jebara 2004). Working together, participants have the opportunity to construct and pool knowledge and tools, bridge gaps in formal health systems (both animal and human), and provide workshops and outreach programs to rural areas and people in an attempt to be advocates for animal and human health related issues that are a concern to a broad audience (Mazet et al. 2014). Managing risks at the interface between wildlife and livestock, pets, and humans, is not the sole responsibility of one government organization, but typically requires inter-agency collaboration, stable partnerships, and effective participant engagement for best results (Mazet et al. 2014). Integrating “a One Health” vision offers an alternative framework for these community-based initiatives, in which cross-sectoral and multi-level involvement are secured and benefits for all participants clearly articulated (Mazet et al. 2014). One Health is increasing in recognition globally, as an alternative approach to dealing with health issues at the animal, human,

environmental interface, as well as cultural, economic and physical factors that impact health (Conrad et al. 2013). In order to have a successful One Health approach to global and local health challenges, effective participant communication and engagement is key (Mazet et al. 2014).

3.2 Study Area

Sri Lanka is an island country in the Indian Ocean (Figure 3.1), densely populated with 20 million people: 333 people per km² (Caldwell 2016; Worldometers n.d.). It encompasses a diverse collection of domestic and wild animal species, which are considered to be of high ecological, social and economic value (Valeix et al. 2011; Worldometers n.d.). Sri Lanka is ranked in the top 25 countries worldwide in terms of rich biodiversity (Wildlife Sri Lanka 2010; Valeix et al. 2011). Sri Lanka has a vast array of wild birds, mammals, reptiles, and amphibians which are unique to the island (Wildlife Sri Lanka 2010). In Sri Lanka, eco-tourism is a major part of their economy. Large population numbers of healthy wildlife, safe food sources, and high public health and safety are key to successful eco-tourism (World Organisation for Animal Health (OIE) 2008).

Sri Lanka has many endemic zoonotic diseases that are detrimental to the health of people, domestic animals and wild animals. (Valeix et al. 2011). Since Sri Lanka is in the zone of high risk for disease emergence, it is of significant importance that there is an investment in an early detection model for pathogens be developed at a national level (Valeix et al. 2011). Sri Lankan officials have acknowledged that both wildlife disease management and surveillance need to be enhanced (Valeix et al. 2011).

Interviews were conducted in Colombo, Kandy, and Peradeniya in participants' place of work (Figure 3.1). Interviews were scheduled ahead of time for the convenience of participants. The capital city of Sri Lanka is Colombo, which is located on the west coast of the country. Both Kandy and Peradeniya are located within the central province and are roughly 6 km apart. Peradeniya is approximately 110 km from Colombo, which is the location of the main university for the central province.

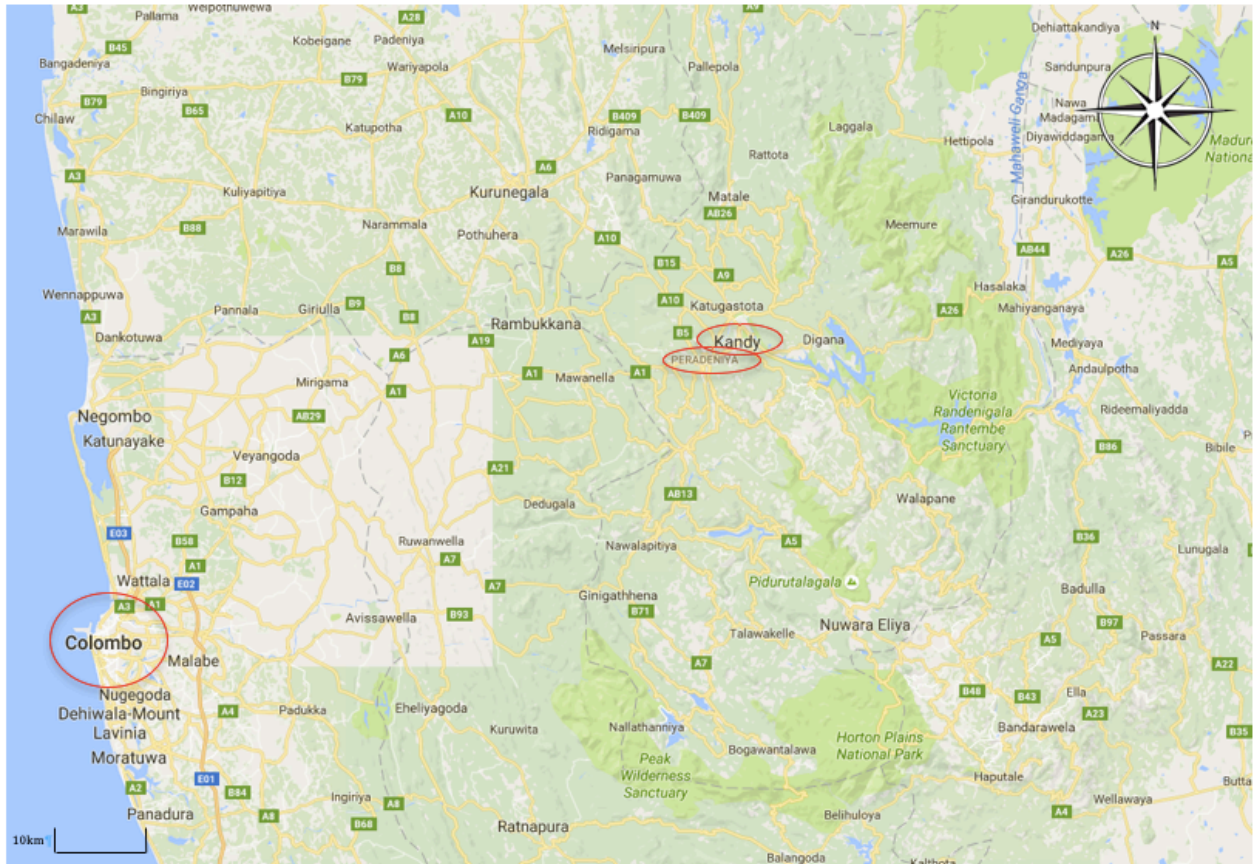


Figure 3.1. Primary locations in Sri Lanka where interviews were conducted July and August of 2015, in Colombo (6.943553, -79.867223), Kandy (7.269965, -80.603986), and Peradeniya (7.260426, -80.595582) (adapted from Google Maps 2016; Operation World 2016).

3.3 Methods

My research was a mainly a qualitative investigation, with some quantitative analysis, so it should be noted that there isn't a clean break between the results and discussion (Barnes et al. 2012). Interviews were based on two of the three dimensions of the integrative interdisciplinary framework of the policy sciences; the social process and problem orientation. Interviews were conducted with people associated with the SLWHC in order to address the interviewee's perception of capacity regarding the need for establishing a sustainable wildlife health and surveillance program. Interviews addressed, but were not limited to, opportunities, best practices, and areas of improvement regarding wildlife disease surveillance within and between the participants of the SLWHC. The participant groups included the University of Peradeniya Faculty of Veterinary Medicine and Animal Science, the Department of Wildlife Conservation, the Department of Animal Production and Health, and the Ministry of Health. All participation was voluntary.

3.3.1 Recruitment and Interviews

Recruitment for the Sri Lanka interviews was done prior to arrival in July 2015. Participants were selected with the help of members of the SLWHC and through personal relationships, e.g. snowball sampling. The Sri Lanka partners at the University of Peradeniya recruited potential interview candidates by giving them a short summary of the study I prepared prior to arrival. If candidates consented to take part in the interviews, they were scheduled to meet at a later date. A total of 34 interview candidates were successfully recruited and interviewed. Sample size was contingent on the willingness of participants to participate. The main objective when recruiting interviewees was recruiting participants from upper, mid, and lower levels of their organization's hierarchy for a diverse representation of each organization. Table 3.1 shows the distribution of participants for each participant group, as well as the proportion of male to female participants. FVMAS had a total of eight participants; six male and two females. DAPH had a total of nine participants; four males and five females. DWC had a total of eight participants; seven male and one female. MOH had a total of six participants; three male and three females. There were also three other male participants who did not belong to one of the core four participant groups. These participants were suggested by members of the SLWHC.

For the purpose of this study interviewees are referred to as participants, but when direct quotes are used participants often used the term stakeholder. Interviews followed the proposed questions (see Appendix A). Prior to the interview process, the survey script and consent form (see Appendix B) were approved by the University of Saskatchewan's Behavioral Research Ethics Board (Beh 15-195) and were reviewed by University of Peradeniya. I conducted interviews in English, except for one interview, where the interviewee was uncomfortable using English, so it was done in Sinhalese by Dr. Manoj Akalanka, a Sri Lankan veterinarian and graduate student working on a separate but related topic as part of our overall International Development Research Centre (IDRC) funding program. This interview was then translated into English by Dr. Manoj Akalanka. No quotes were used from Dr. Manoj Akalanka's interview as results. The remaining 33 interviews were transcribed verbatim by me. Since the interviews were transcribed word for word from participants, some errors in English grammar do occur. For the majority of interviews, I used direct quotes from participants in my results, which are seen within quotation marks. However, there were some interviews where I paraphrased what the participant said, without losing the integrity of the participant's response. This was done to limit lengthy and wordy quotes.

Interview questions were open-ended. Interviewees were able to be as elaborate, vague or concise as they want. Probing questions were also used to draw out as much specific information as possible related directly to my research objective, which are listed in Chapter 1. Probing techniques are used to clarify a participant's answer that is not fully understood or where it is desirable to learn more about a topic, by using follow up questions (see Appendix A). Open-ended interviews were based on a structured set of questions, with identical questions asked of all participants. Respondents were provided opportunities to discuss topics and responses that can go beyond the initial structured questions. Participants could provide more than one answer to a given question or in some cases, participants did not answer the question at all. Therefore, in the results some of the numbers provided do not equal the participant interviewee numbers (n=34). Interviews were numbered based on the date they were completed and given a unique code (YY-MM-DD-XXX) to ensure anonymity.

By allowing time for preliminary interview preparation, a researcher can either alleviate or intensify potential problematic circumstances that may occur once the research is implemented (Turner 2010). I used McNamara's (2009) eight principles for the preparation stage of

interviewing. These include: choose a setting with little distraction, explain the purpose of the interview, address terms of confidentiality and consent, explain the format of the interview, indicate how long the interview usually takes, tell them how to get in touch with the researchers later if they want to, ask them if they have any questions before you both get started with the interview, and researchers should have a method of recording the responses such as a digital voice recorder or video camera. Interviews were scheduled according to a date and time that best worked for the participant. They were all briefed prior to the interview of the purpose of the research. Each candidate read and signed a confidentiality and consent agreement (see Appendix B). If participants had any questions prior to the commencement of the interview, they were answered to help alleviate any worries.

3.3.2 Applying The Integrative Interdisciplinary Framework of the Policy Sciences for the SLWHC

Clark's integrative interdisciplinary framework of the policy sciences (2002) was used as the basis for organization of interview responses. The policy sciences provide a practical guide for professionals to deal with complex real life issues (Clark 2011) such as disease detection and management. The integrative interdisciplinary framework provides a toolbox that can be used to help organize thoughts, knowledge and problem solving efforts in order to define the problem at hand and understand its full context (Clark 2011). The framework was used to define gaps and opportunities that the SLWHC has.

The results from participant's interviews have been categorized based on the five tasks of the problem orientation dimension. The first task in the problem orientation is to clearly clarify the goals or objectives and determine how they hope to accomplish the desired outcome. "*Goals are the preferred outcomes in a specific context in terms of the distribution of values, practices, and institutions*" (Clark 2011, p. 88). The second task is to describe all trends, this includes past and current trends (Clark 2011). Trends in the social process, environmental variables, and people's perspectives should be established (Clark 2011). Analyzing conditioning factors is the third task in problem orientation, in which factors that have impacted past events and decisions will be evaluated (Clark 2011). This task is reliant on the subjective status of the researcher, as we are reliant on their perceptions of the data, most of which is based on emotion, feeling, thoughts, and patterns of identity (Clark 2011). The fourth task is projecting developments, specifically projecting future trends in events and decisions (Clark 2011). Based on the

projections in this step, it will influence the final task, which is inventing solutions (Clark 2011). Policy is about looking into the future; therefore projections need to be about what is most likely to happen (Clark 2011). In order to have an accurate picture of future projections, all expectations need to be mapped out as accurately as possible. The last task in problem orientation is to create, evaluate and ultimately choose a policy alternative for the problem at hand (Clark 2011). This last task will help bridge the gap between goals established by participant groups and a realistic future model. An accurate problem orientation allows researchers to develop a strategy for rational action, regardless of their field of work or study (Clark 2011).

After the problem orientation is complete the social process is evaluated, followed by the decision process. These two processes are the means of resolving issues or gaps that are a concern and coming to an understanding on policy (Lasswell 1971). The social process contains eight components: participants, perspectives, situations, base values, strategies, outcomes, and effects. Attending to the social process ensures that the data were analyzed to their full extent and that no important pieces were left out or misinterpreted during analysis (Clark 2011). The social process is used to analyze interactions between people and institutions to create meaningful trends (Clark 2011). The social process table (Table 3.8) was used to determine similarities and differences between participant groups of the SLWHC, or within participant group's hierarchal structure. Participants were broken down into the hierarchal structure (upper, mid, and field level) of the four participant groups. Based on trends observed in NVivo from participant's responses, common interests and trends were assigned at each hierarchal level for each participant group for each of the eight tasks of the social process. Perspectives included demands, expectations, and identifications of the participants of each participant group. Situations identify in what circumstances participants interact with each other or within their own participant group. Situations can be further broken down into ecological or geographic information, temporal dimension, institutionalization, and crises or intercrises. For example, in ecological or geographic situations, participants were more likely to interact if they resided in the same city or if their company's goals were focused on the same ecological concerns. The temporal dimension was based on the likelihood of participants interacting due to timing of events and processes, such as the start of the SLWHC. Institutionalization looked at how values were allocated by participants during a particular situation. In crises or intercrises situations, the likelihood of participants interacting due to a disease outbreak was analyzed. The fourth task is base values, these are

values that are already possessed by participants such as power, enlightenment, wealth, well-being, skill, affection, respect, and rectitude. There are also scope values, which are sought after or demanded by participants. Strategies are what participants use in order to achieve their desired goals. This includes diplomatic (negotiation), ideological (ideas), economic (goods), and military (arms) strategies that could be used by participants to achieve their goals. The seventh task, outcomes, is what is achieved during continual interactions between participants and groups on a short-term basis. This includes values that are accumulated or lost during the process and decision choices. The last task, effects, are long-term results of participant interactions. This includes values accumulated or lost, institutional practices, diffusion or restriction of innovations. This task looks at if any new practices have been adopted and if old practices have remained in place (Clark 2011). Both the social and decision process reflect the eight base values; power, wealth, enlightenment, skill, well-being, affection, respect and rectitude (Clark 2011). With the help of this integrative interdisciplinary framework, gaps, opportunities, and ultimately recommendations based on my research objectives will be evaluated for the SLWHC.

3.3.3 Analyses

The practical aim of my research is to inform government participant groups of areas of concern that were brought to light by each participant group, and to create a broader understanding of inter-sectoral dynamics and best practices in overall disease monitoring, and management. These recommendations will include BP that can help participants on the SLWHC achieve their goals and common interests. They will also include recommendations for improving existing communication channels, or how to establish new ones that focus on communication regarding wildlife, domestic, and livestock disease surveillance within and between the participants of the SLWHC.

Analyses was both qualitative and quantitative, with the aid of the program NVivo for Mac (version 11.0.0 by QSR International) to establish trends and nodes in the data. This program was an organization tool that allowed identification of trends for a particular participant's response to a question or responses from all four participant groups to a particular question. The remaining dimension on the integrative interdisciplinary framework, the decision process, was used as a template to aid in the synthesis of participant's responses and determine where the SLWHC could make improvements. The decision process questions in Table 3.2 were

used to guide my interpretations of participant's responses when creating codes in NVivo. The main objective during this stage of the data analyses was to identify gaps in knowledge pertaining to information regarding wildlife disease surveillance and communication. Excel was used to perform multiple t tests to test if any of the participant group's responses were statically different from each other when participant groups were asked to score their level of communication with the other participant groups.

Table 3.1. Number and gender of interviewees (n=34).

	FVMAS ¹	DAPH ²	DWC ³	MOH ⁴	Other	Total
Male	6	4	7	3	3	23
Female	2	5	1	3	-	11
Total	8	9	8	6	3	34

¹ University of Peradeniya Faculty of Veterinary Medicine and Animal Science

² Department of Animal Production and Health

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Table 3.2. Questions to ask throughout the interdisciplinary decision process (adapted from Lasswell 1971; Willard and Norchi 1993; Clark and Brunner 1996; Clark and Wallace 1998; Clark 2001).

DECISION PROCESS

1. **Initiation:** a problem is identified and brought to the attention of a group of people who would show concern. Outcomes: bringing information about the problem to attention, including initial problem definitions and proposals. Standards: reliable, comprehensive but selective, creative and open.
 - a. How did the problem originate?
 - b. Who was the first person to bring it to the attention of other participants?
 - c. Was the problem identified in an acceptable time frame?
 - d. Which participants' interests are favoured when defining the original problem?
 - e. How should the initiation phase proceed?
2. **Estimation:** professional analysis, focus groups and meetings with relevant stakeholders is done to define the problem. Outcomes: gathering, processing, and disseminating information for decision-making, includes alternative policies. Standards: rational, integrated, comprehensive, and effective.
 - a. Has information regarding the problem's context been collected from all relevant participant groups?
 - b. Which participants is information being communicated to?
 - c. How is the information being used between participants?
 - d. Which participant groups suggest certain courses of action?
 - e. Which values are promoted and which are not by each participant group?
 - f. How should the estimation phase be carried out?
3. **Selection:** a response to the problem is created, discussed, prescribed, and authorized by a professional source. Outcomes: formal/informal policies that stabilize expectations regarding the rules that need to be enforced under different situations. Standards: comprehensive, rational, and open.
 - a. Will the new prescription complement or hinder rules already in place by government participant groups' organizations?
 - b. What rules do participant groups set?
 - c. What aspects of the prescription are obligatory and which are not?
 - d. How should the selection phase be carried out?
4. **Implementation:** a program is created and then applied to the problem. Outcomes: final characterization of a specific prescription. Standards: timely, open, dependable, rational, uniform, effective, and constructive.
 - a. Is implementation consistent with the prescription?
 - b. Which participant will enforce the rules?
 - c. How should enforcement be carried out?
 - d. How will potential disputes among participants be resolved?
 - e. How should the implementation phase be carried out?
5. **Evaluation:** appraisal of the implementation effort and original policy formulation. Outcomes: evaluation of the flow of decisions related to the prescriptions or goals, and identification of participants formally/informally responsible for success and failures. Standards: dependable, realistic, ongoing, independent of special interests, and fully contextual.
 - a. Which participants are being served by the program and which are not?
 - b. Is the program evaluated in full on a regular basis?
 - c. Who is held accountable for success or failure?
 - d. Who appraises one's own activities?
 - e. How should the evaluation phase be carried out?
6. **Termination:** discontinuation, revision or success of policy formulated for the problem. Outcomes: ending a prescription and concentrating on claims of participants who were accountable when the prescription was in effect. Standards: prompt, respectful, comprehensive, balanced, and ameliorative.
 - a. Which participant should stop or change the rules?
 - b. Which participants' benefit and which do not from the program ending?
 - c. How should the termination phase be carried out?

3.4 Results

3.4.1 Clarifying goals

The diseases of concern to the participants are listed in Table 3.3, with the frequencies as mentioned by participants. There were many animals mentioned by participants that should be focused on for wildlife disease surveillance. These are shown in Table 3.4. The most overlap between responses was for the categories of birds, all animals, wildlife animals, and elephants.

One participant suggested it may be beneficial to initially start out with a “blanket surveillance” as they called it, which would be collecting whatever information they can and then once they know what diseases/animals to focus on, initiate a targeted surveillance (15.08.12-002). The same participant also mentioned that even though all the individual participants collect good information, they do not disseminate it to the proper participants (15.08.12-002). A participant from the DAPH said there needs to be more awareness programs:

“I know the project is working on this, but it needs to spread to other parts of the country, it needs to go to the field level, field vets, and to the vets working in the jungle area. So, these people must be informed, it is better if it goes through the proper channel, those bureaucratic pathways, by a letter or something like that. Then people will do something, otherwise their time is replaced by a lot of other mandatory work” (15.08.12-005).

A participant from the DWC said in order to maintain a healthy wildlife population, having a monitoring program or surveillance program is key, in conjunction with early detection. It was also mentioned how important Sri Lanka’s wildlife are to the tourism sector, which is a big concern of the people of Sri Lanka (15.08.10-001). One participant struggled to answer what specific problems should be focused on in regard to wildlife disease surveillance, *“This is the grey area in the country, because we have very little information, meaning we don’t know really what diseases there are in the wild”* (15.08.18-002). However, it was mentioned by eleven participants that wildlife disease surveillance is hard to facilitate due to the lack of resources and manpower, *“surveillance of diseases is a very difficult task, need a lot of resources: material and people. We still do not have enough resources. Need the commitment of the people”* (15.07.24-003).

The four main participant groups were all concerned with developing a strategy to pool together resources, personnel, and knowledge. Participant groups wanted to implement the best way to not only decrease the rate of various zoonotic disease outbreaks between people and animals of Sri Lanka, but also work together to control and prevent future outbreaks. Participants (n=34) held both human and animal health to the utmost priority. These participants were interested in seeing the progression of the SLWHC by the four relevant participant groups working together with optimal communication and commitment of personnel.

Table 3.3. Diseases of concern mentioned by participants with their corresponding frequencies, organized by participant group.

	DA PH ¹	DWC ²	FVMAS ³	MOH ⁴	Other	Total
All Diseases	1	1	-	-	-	2
Avian Influenza	-	2	2	-	-	4
FMD ⁵	2	1	1	-	-	4
Leptospirosis	1	-	3	-	-	4
Tuberculosis	1	2	1	-	2	6
Rabies	1	-	5	1	1	8
Skin Rashes	-	-	1	-	-	1
Swine Fever	-	1	-	-	-	1
Viral Disease	-	-	1	-	-	1
Zoonotic Parasites	-	-	2	-	-	2

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⁵ Foot and mouth disease

Table 3.4. Animals of concern mentioned by participants with their corresponding frequencies, organized by participant group.

	DAPH ¹	DWC ²	FVMAS ³	MOH ⁴	Other	Total
All	1	-	1	1	-	3
Bats	-	-	-	1	-	1
Birds	1	2	1	-	-	4
Carnivores	-	-	-	1	-	1
Dogs	-	1	-	-	-	1
Elephants	1	-	1	1	1	4
Mammals	-	1	-	-	-	1
Reptiles	-	1	-	-	-	1
Rodents	-	-	-	1	-	1
Small wild ruminants	-	1	1	-	-	2
Wild animals	1	1	-	-	-	2
Wild buffalo	-	-	1	-	-	1
Wild pig	-	-	1	-	-	1

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² Department of Wildlife and Conservation

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⁴ Ministry of Health

3.4.2 Describing trends

Because the SLWHC was newly established at the time of this research, there was less focus on past trends, and more on present trends that participants have become aware of since the start of their involvement with the SLWHC. When participants were asked their understanding of the role of the SLWHC, a broad set of answers was acquired. Many participants raised concerns about improvements that the SLWHC needed to address. These concerns and improvements have been categorized into five broad trends. These five trends were the most common trends that overlapped between participant groups. Table 3.5 lists the five trends along with the frequencies of the concerns and improvements that were raised.

Table 3.5. Trends extracted from interviews with study participants and their associated frequencies.

Improvement/Concerns	Frequency
Dissemination/collaboration of information and data	39% (n=51)
Processes/procedures	18% (n=24)
Communication between institutes	16% (n=21)
Training	15% (n=20)
Infrastructure	12% (n=16)

3.4.2.1 Dissemination/collaboration of information and data

The most common (39% (n=51)) improvement or concern participants had regarding the SLWHC was the dissemination and collaboration of information and data within or to other participant groups. *“There should be a place to establish and communicate and collect data and disseminate information to government authorities.”* (15.07.24-004). *“Communication and generating and distributing data among all the interested parties.”* (15.07.23-002). When participants from each group were asked to describe the role of a wildlife health surveillance system, the following quotes were typical answers obtained across disciplines. A participant from the FVMAS said that the goal of surveillance:

...is to monitor the current wildlife health status in Sri Lanka and predict wildlife health status in the future and generate data, which can be used for predicting maybe the next zoonotic outbreak. The main point is we have to break the barriers in between many disciplines, for instance if you can collaborate between interested institutes (15.07.23-002).

“Surveillance means systemic ongoing collection of data for action basically, so it has to be systemic (15.08.18-001).

Five participants discussed that the role of wildlife disease surveillance should not be the concern of one individual participant group but should be the responsibility of all participants who are relevant to wildlife disease surveillance. A participant from the DWC said that the collaboration between the DWC and MOH is extremely important, especially in regard to diseases that affect both participants, like leptospirosis (15.08.10-001). A participant from FVMAS said, *“Wildlife surveillance is important to all of us, the whole world, especially this part of the world so it covers a broad area. So, all of these institutes should get involved, but mainly wildlife vets and health should be the main people to get involved”* (15.07.24-003).

Participants from FVMAS talked about their indirect contribution to wildlife disease surveillance, and what they can contribute to help other participant groups. *“Faculty cannot do fieldwork but can do diagnostic work and can help with knowledge and technical support. DAPH, DWC, and MOH they can come together in the wildlife disease surveillance programs as one center”* (15.07.23-001).

Everyone should be aware of the national need for this and they should all cooperate with our (FVMAS) efforts by sending carcasses, early diagnosis based on the clinical signs and they should cooperate in transporting the material and the lab stuff should do as quick of a diagnosis as possible and those messages should be transmitted to the higher authorities so that they can be taken up by different ministries (15.07.24-002).

If we are going to control zoonotic diseases as well, the health side, human, animal, and wildlife have to work together. So, if we can work together, that means the government side, ministry, DWC, and MOH probably as the island we are having more chance to control a lot of disease we work together and work hard (15.08.17-001).

When participants talked about the dissemination and collaboration of data, one participant also talked about including the public. It was mentioned that if the general public had a better idea about wildlife and their diseases that the likelihood of wildlife experts being informed about potential diseased carcasses may increase (15.07.23-003).

When asked in what capacity and what type of contact do you have with the other three participant groups, six participants said that they would only communicate with each other under certain circumstances. The following participant said,

If there are special projects or a specific outbreak of disease, then they will have close contact between the 3 organizations. Otherwise every stakeholder does their own research and they do not communicate and share data. There should be combined conferences on a regular basis, like each individual stakeholder group has annual conferences within their own organization (15.07.24-004).

“I think the only type of meeting or conferences or training programs were after this project” (15.08.12-005). “We have lack of normal data collection procedures to have such communication, to have such communication we need a regular monitoring system, when after each month there is some distribution of knowledge and data” (15.08.10-001).

One member of the DAPH stated,

As everyone knows the wildlife is not in a separate compartment, the wildlife and livestock they always mingle together in the interface. So, if there is a disease in wildlife, definitely there is a threat to livestock, as well as vice versa. So, we cannot isolate ourselves in the compartments, so it is more or less together. (15.08.14-002).

A member of the MOH described their role, *“with zoonotic diseases we have a role to play” (15.08.10-003). But in certain areas we work jointly, for example rabies. It is very*

important that we work together, they have a huge role to play and so do we” (15.08.19-001).

Some members of the FVMAS say they have a big role to play, *“being the only vet faculty in the country, we have a major role to play” (15.08.12-001).*

3.4.2.2 Processes/Procedures

Most participants (18% (n=24)) had suggestions for improvements for the SLWHC regarding processes and procedures. The concerns about processes and procedures included reporting, communication, and dissemination of information during normal conditions and during an outbreak.

One participant stated that there is no real formal way of reporting, and they didn’t know exactly who to contact if they did have information to share. There was concern regarding the level of information collected on wildlife disease, and who should be responsible for compiling it. *“We don’t get adequate animal disease information regarding the wildlife.” (15.08.14-002).* *“There should be some procedures at all different levels, each and every person should be responsible to identify the case, confirm it and disseminate the info, so there should be some sort of system or network at the regional level within the DAPH, MOH and DWC” (15.07.24-004).*

The SLWHC should be the monitoring body to do the surveillance, collect relevant information and get the results of the surveillances. They have to work with other relevant authorities, maybe health, public DAPH. They should be the coordinating body to inform about wildlife diseases, maybe zoonotic, maybe non-zoonotic specific to animal populations. They should be the center role to play and the leading role. (15.07.30-002).

There were inconsistencies present in the level of knowledge among participants regarding processes and procedures. Two participants stated that there were no processes or procedures when it comes to a disease outbreak. *“No formal process that we have, but we can only inform the others when such a thing happens, but there is no regular communication between individuals regarding that type of thing” (15.07.28-001).* *“There is no standard operating procedures, the formal link is not there” (15.07.30-003).*

Two participants said that there are certain processes and procedures put in place, especially in the event of a disease outbreak. One participant from the MOH says there is a formal procedure; *“There is a procedure that would be followed, there is a focal point, a spokesperson for mass media/mass communication, different jobs/roles would be identified”*

(15.08.10-003). *“There is a set procedure that would be followed”* (15.08.14-002). This participant continued to elaborate that the DAPH has a set of forms and procedures that are laid out that they have to fill out and communicate via the forms, instead of simply telling them what they want.

If wildlife disease, they have to report to us (DAPH), they have to tell us and we have other focal points, the OIE, the DG of the DAPH is their national delegate. He has focal points; one focal point is the director of wildlife health and they have to submit a report every 6 months. So, it comes here in our division, we check here and then we submit to the OIE. Then we have ground level communication, coordination between vets (15.08.14-001).

Participants stressed the need for processes and procedures to be put in place so that in the case of a disease outbreak, so they have something to follow. *“There should be a procedure, if such diseases are detected these diseases should be done and to confirm it, but at the moment there is no such network to build to act or attend. I think the communication is there, but it is not that active”* (15.08.10-001). *“Through these committees they must share the information and coordinate. We must develop a system to communicate with each other and work together, that isn’t happening yet”* (15.07.30-004). One participant described how after an avian influenza outbreak, the DAPH developed standard procedures and identified certain groups and people who should ultimately receive the information (15.08.12-006). It was suggested by one participant that the technical committee should come together and meet, to discuss these procedures and finalize a solution.

For example, we detect rabies in a species where we have not detected it before. So immediately we would inform all the members of our technical committee and have a meeting and then you would officially inform the DG of the DWC and the DG of the DAPH that we have detected this. We would use the facilities of the faculty and the VRI and MRI as the first step and then we would ask that the DG of DAPH who is the legal authority would send this abroad for further diagnosis/conformation/characterization (15.08.12-002).

The DAPH and DWC are the main stakeholders in regard to wildlife health, because in Sri Lanka the biodiversity of animals is very important, and we have a very strong biodiversity. The domestic animals come into close contact with the wild animals therefore the domestic animal health is very much affected and influenced by wild animal

health. Therefore, it is very important that they understand this connection and get the information at the correct time. (15.07.28-001).

A participant from the MOH says, “*we are not keeping an eye on wildlife diseases, we need to identify them when they are just coming up, which would be very beneficial to contain a disease outbreak and protect the people (i.e. Ebola, Avian Influenza)*” (15.07.30-004).

Some participants described their organization’s role in wildlife disease surveillance in more detail, and what processes and procedures they have in place regarding communication channels and nodes of contact. A participant from the DWC described their role as:

There should be a communication system for feedback about the samples sent and there should be a database system to enter the data about what they are sending and what they get back. And based on that they can determine the field situation and take preventative actions (15.07.24-004).

Other participants stressed the need of communication channels to help facilitate conversations.

There must be a regional coordination mechanism, we must form committees with the animal and human health authorities and the local authorities. There must be some regular meetings to share the information, we are moving forward, but it is slow (15.07.30-004).

One participant from the DWC said if they had to contact someone specifically it would be the Animal Health Division for the DAPH and for the faculty it would be a related specialist.

DAPH has some system of disease control act, they have their legal powers, especially when dealing with the farmers and livestock. The DAPH needs to take the necessary step to control movements and livestock movements, so this purpose they should be in the system. (15.08.19-002).

One participant talked about the inclusion of NGOs regarding wildlife disease surveillance communication channels. However, this participant was unsure on the impact NGOs should have, “*they have a role to play, but at what level we need to decide*” (15.08.19-001).

Participants were then asked in what form would this information (about wildlife disease surveillance) best be received. Some participants (n=5) said they would like a phone call and then

would like the information in writing later on. It was mentioned that if the information were received in an official manner, this would be best. Information should be received from a reliable source and possibly in the form of scientific writing. Participants were then asked where they would like to receive this information from, i.e from what agency, organization, person or any other source they would like to get this information from. Some members of the DAPH (n=3) said they would be fine receiving it from anyone who discovers a notifiable disease. All participants from the DWC (n=8) said it either didn't matter where the information came from or they would like to hear it from the Director of Animal Health.

The next question was where participants would like to see this information go to. Members of the DAPH (n=9) said they would like to see it go to the submitter, the public health sector, the DAPH, the Veterinary Investigation Officers (VIOs), the Director General (DG) of Animal Health, and the Veterinary Research Institute (VRI).

For example, for reporting all notifiable diseases in animals, the DAPH is the legal authority for The World Organization for Animal Health (OIE) and other aspects. So, the DG of the DAPH has to report any notifiable diseases to the OIE for all animals (15.08.12-002).

MOH participants (n=6) said they would like the information to go to the relevant participants and health workers. FVMAS participants (n=8) said the information should go to the DAPH, people living in villages, as well as the livestock and wildlife people of villages. The majority of the DWC would like the information to go to all participants who are applicable to the situation at hand, as well as regional wildlife officers. One participant who was not part of the four main participant groups said the information should go to veterinarians, managers, and directors.

3.4.2.3 Communication between institutes

It was stated 21 times (16%) that there needs to be better communication between institutes. *With some diseases common to domestic animals, wildlife and humans, we don't have enough communication within these organizations and other stakeholders (15.07.24-004).*

The following participant emphasized the importance of communication between all four government participant groups,

Make the vet graduates and scientists aware of the value of communicating between four divisions because one (stakeholder group) cannot address wildlife health and potential zoonotic diseases on their own, there should be closer collaboration between wildlife, animal production, health, and the provincial departments and the faculty (15.07.24-002).

One participant discussed the significance of including the MOH when dealing with zoonotic diseases,

The MOH should be informed about what is happening at the wildlife health level because most of the diseases which are coming to the humans are originated from the wild animals, therefore the wildlife health sector should be well informed what is happening (15.07.28-001).

When asked in the event of an outbreak would you have contact with the other three participant groups, 19 (70%) of the participants said they would have contact with the other participant groups and of those 19, 47% (n=9) said they would contact all three of the participant groups. Three participants (11%) said no and five (19%) said they would potentially contact other participant groups. Participants often said (n=5) contact would depend on the type of outbreak and each individual situation at hand. One participant who was with the MOH said they would have contact with the other participants during an outbreak, but on a regular basis they do not have much contact with them (15.07.30-004).

Participants were asked if there was a disease detected or if there was an outbreak, what would you want to happen within your organization regarding communication. Some (n=3) participants talked about how reporting would occur. Two of the participants said the reporting would occur via phone call, email was also mentioned as a possible mode of communication. *“We need a telephone call immediately and then need an official letter in writing” (15.07.31-001).*

Many participants said who they would directly contact each participant group in the event of an outbreak, Table 3.6 shows a breakdown of responses. The majority of participants (82%) said they would contact the DAPH or DWC, mainly starting at the top at the DG level and then dispersing information downward. *“First of all, we let the director of health know, who will inform the DG and the DG will inform whatever organizations need to know. And then they all get together and make decisions” (15.08.10-002).*

Table 3.6. Summary of participant's responses regarding who they said they would reach out and contact in the event of an outbreak.

DA PH ¹	DWC ²	MOH ³	FVMAS ⁴	Other
-DWC	-Director General	-General Health	-DAPH	-DAPH
-Policy makers	of Health	Services	-Director	-All members of
-All vets in Sri	- Director	-District level	General of	technical
Lanka	Wildlife Health	-Epidemiologist	DAPH	committee
(DAPH/zoo/wildlife)	(DWC)	-Medical		-Director General
-Director of Wildlife	DG of DWC	officers		of DAPH
Health (DWC)				-Director General
				of DWC

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When asked in what capacity and what type of contact do you have with the other three participant groups, 37% (n=13) said communication is sufficient, sufficient meaning that communication may not be 100% ideal, but it was satisfactory for the participant. *“The other three organizations are under the same government umbrella, so we have an administration mechanism there are channels like that. If we want to contact them there are ways and means to contact them”* (15.08.18-002). *“I think this is fairly okay”* (15.08.14-002). *“We have different types of meetings, phone calls, awareness programs, many things”* (15.08.10-002).

When participants were asked about the level of communication, they have with other participant groups, 63% (n=21) said that communication was insufficient. It was acknowledged that since the start of the SLWHC communication has improved, but participants stated that it is still less than ideal. When participants were asked to rate communication between other participant groups on a scale of 1 to 10, (1 being no communication at all, 5 being moderate communication, and 10 being ideal communication (communicate every couple of days)), the MOH received the lowest average score of 5 (scores ranged from 1 to 10), followed by DWC 5.25 (scores ranged from 1 to 10), FVMAS 5.5 (scores ranged from 1 to 9), and lastly the DAPH with 5.9 (scores ranged from 1 to 10). *“With the start of the SLWHC, we are now having contact, but prior it was very poor, had some contact with public health sector for avian influenza surveillance but not for other diseases”* (15.07.23-003).

Figure 3.2 shows the communication scores for each of the four participant groups received based on individual participant responses. There was no statistical difference in scores between the DAPH and DWC (p=0.523); between the DAPH and FVMAS (p=0.668); between the DAPH and MOH (p=0.406) between the DWC and FVMAS (p=0.794); between the DWC and MOH (p=0.813) or between the FVMAS and MOH (p=0.628).

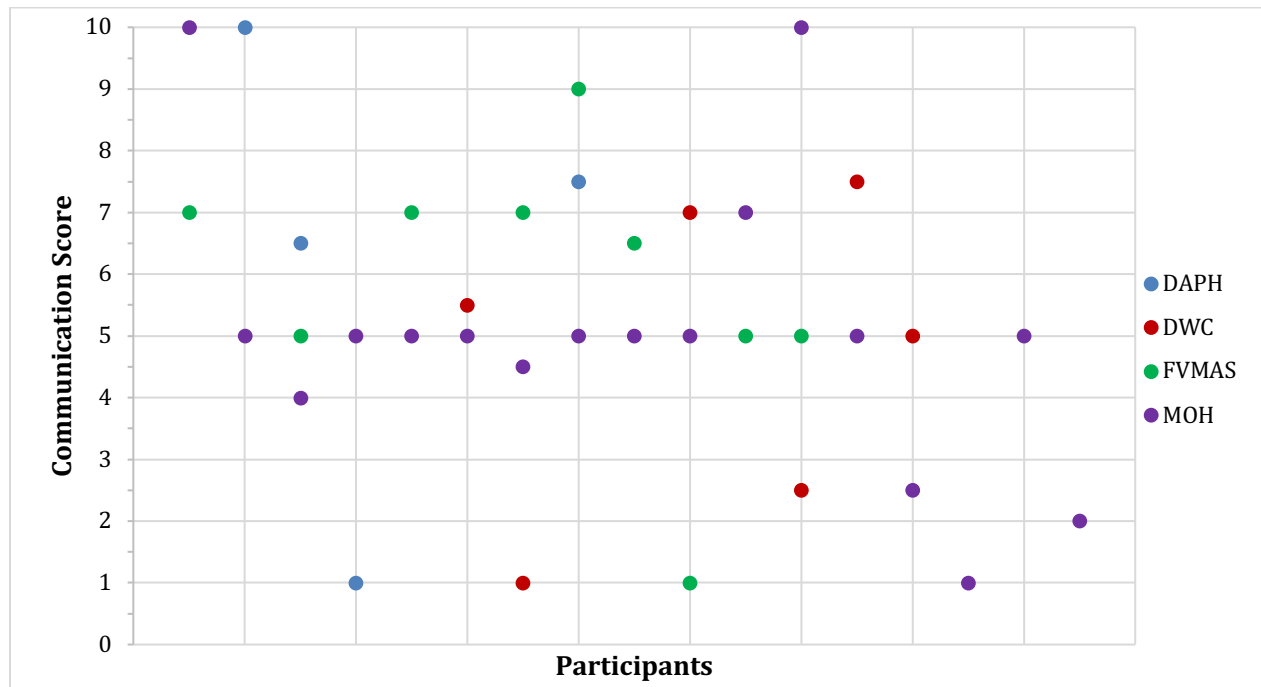


Figure 3.2. Communication scores, as stated by individual participants, for communication between participant groups. Communication was ranked on a scale of 1 to 10. 1 being no communication at all, 5 being moderate communication and 10 being ideal communication (communicate every couple of days). Interviews (n=34) were conducted in Colombo, Kandy, and Peradeniya, Sri Lanka in July and August 2015. Not all participants answered the question in full.

There were five participants who mentioned that communication only happens under certain circumstances, *“With all institutes we are communicating, for all three organizations we are dealing with in an equal manner, but usually communication starts when some issue comes, like bird flu. Otherwise there is no regular based communication”* (15.08.10-001).

Actually it is not like this, when necessary definitely we are having communication, we try to find the actual person who is directly involved with that problem and we make communication over the phone, sometimes through letters, sometimes we visit there and directly discuss with people (15.08.17-001).

The following participant discusses the informal communication channels that are present, as well as the lack of continual communication.

If matters come than we contact them, otherwise we don't talk regularly, the thing is we don't have time to chat like that, unless we meet at a party or occasion like that. If we have an issue, if we can get some assistance from some other organization, we contact them and get their assistance (15.08.18-002).

Some participants suggested that communication needed improvement with specific participants. A participant from the FVMAS said they would like to see improved communication with the DAPH. A participant who was not part of the core four participant groups said they would like to see improved communication with the health department. Lastly, a participant from the DWC said they wanted improved communication with the DAPH.

Participants were asked how good communication is within their own organization/company regarding wildlife disease. They were asked to comment on how much it is talked about, what form of communication they use, and how often they communicate. The responses were sorted into four groups depending on how good communication is: sufficient, insufficient, unsure, and special circumstances. Some participants stated that communication was just okay within their own organization. Other participants stated that they would only communicate within their own organization under special circumstances; *“If we have a very specific problem it will go around the faculty, other than that there is little communication about wildlife.”* (15.07.28-001).

Twenty-seven percent (n=7) said communication was sufficient, 23% (n=6) said it was insufficient, 27% (n=7) said they were unsure and 23% (n=6) said they used communication in

special circumstances. For the participants who responded and said communication was insufficient, some (n=2) stated that the WHHNP was the only thing helping with communication, *“Not very good at all, other than the project, the project does well but beyond that very poor”* (15.07.24-002). A participant from the DAPH stated *“not very good, almost nil actually, I’m trying to do something to start working with wildlife. But the department’s priorities are different”* (15.08.12-003). A breakdown of the various percentages can be seen in Table 3.7.

Of the participants who were from the FVMAS, 57% (n=4) said communication was sufficient. One participant attributed this to a small faculty and that most faculty members know one another (15.07.24-003). They also said that the communication within the faculty may not be ideal, however they rated it 7-8 on a 10-point scale. Figure 3.2 shows the distribution of responses for the four groups of communication within each participant group. The FVMAS had the highest response rate to say communication was sufficient. The DWC frequently described communication, as they weren’t sure. No DAPH participants said communication was sufficient, the vast majority said it was insufficient or they were unsure. The MOH split their responses equally between saying communication was sufficient, unsure or communication was present in special circumstances.

Table 3.7. The percentage of responses for each participant group when asked “How good is communication within the organization/company regarding wildlife disease?”

	Sufficient	Insufficient	Unsure	Special Circumstances
FVMAS ¹	57% (n=4)	29% (n=2)	0% (n=0)	14% (n=1)
DWC ²	29% (n=2)	0% (n=0)	43% (n=3)	29% (n=2)
DAPH ³	0% (n=0)	38% (n=3)	38% (n=3)	25% (n=2)
MOH ⁴	33% (n=1)	0% (n=0)	33% (n=1)	33% (n=1)

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² Department of Wildlife and Conservation

³ Department of Animal Production and Health

⁴ Ministry of Health

3.4.2.4 Training

More training was mentioned 20 times (15%) by participants. One participant discussed that there was a lack of training provided from the SLWHC, even though they were told they would receive it. *“We have never got the training from this centre, although they have mentioned we are getting that training and these vets are going to be trained like this.”* (15.08.19-002). *“Research training and producing skill development, important for students to be gaining these skills and knowledge and stay in the country.”* (15.07.30-004).

Four participants directly acknowledged that the FVMAS’s main role in wildlife surveillance is mainly research, providing the lab facilities, educating its students about wildlife management, wildlife diseases and surveillances, as well as the technical expertise side of things (15.08.14-001; 15.08.18-002; 15.08.19-001; 15.08.19-004).

Also, especially in the wildlife disease, if there is something recorded in the field, we get their assistance, the Udawalawe transit home, we will notice some animals are getting sick or ill. So, if our vets feel that they cannot engage, they ask for assistance from the University or DAPH. (15.08.18-002).

The mandate of the faculty is to produce good knowledgeable vets, ones who passed out should be practical. There are so many animals, and we hardly manage these kinds of things, the faculty needs to improve the mentality of the vet, the role is there (15.08.19-002).

Seven participants mentioned that in order to do proper wildlife disease surveillance there needs to be adequate training, staff, facilities, and resources.

DAPH they can acknowledge about the importance of wildlife disease surveillance and give knowledge to field vets surrounding the wildlife parks and wildlife areas so if general public notice a mortality, they get informed and they want to know it so that way we can acknowledge the importance of wildlife surveillance. For instance, we can involve them in our wildlife health surveillance, providing skills, training program, providing lab facilities, maybe increasing the number of persons who they have working under them, that’s the departments role. (15.07.23-002).

3.4.2.5 Infrastructure

Sixteen participants (12%) brought up the lack of infrastructure that is present for the SLWHC. Infrastructure included buildings, databases, computers, and computer programs. Currently the SLWHC is just a virtual center, with no actual building. Participants acknowledged the struggles this poses for themselves, as well as the public.

We rely heavily on the general public for information, the information can come to them through vets, through the MOH. So, the general public has to see an office/building, see some physical structure, people also need to see publicity related to this, this is how our country works. There are physical structures already that would do this, university, DAPH, etc., but the SLWHC is a concept and it does not have a building and there is no physical place to see. People already know the DAPH, Wildlife Health Centre, University are there, so this is not new, what is new is the concept of people coming together (15.07.24-001).

I think there should be a centre for communicating development authorities DWC, DAPH, MOH, and other stakeholders, currently there is no such place. So maybe it is gathering some data and sharing information within them, same as MOH with data processing. There should be a place to establish and communicate and collect data and disseminate information to government authorities. (15.07.24-004).

One participant mentioned that the lack of a proper office poses challenges for them. *“Sending samples to a lab is a very big job. You have to send a person and the sample and don’t have the best facilities to keep the sample, so this is an infrastructure problem. Now they don’t even have a proper office.” (15.08.10-001).*

One participant said that this is an ongoing issue that will not be solved once the project has ended, it needs to be continuously updated to be of any use. *“It’s not like a project, where you finished once your objectives are met, this has to be continuous and ongoing using the infrastructure” (15.08.18-001).*

3.4.3 The Social Process

Table 3.8 summarizes the social process mapped out, with distinctions made between hierarchal levels within each of the SLWHC's four participant groups.

Table 3.8. The social process mapped out for the hierarchal structure of four government participant groups of the Sri Lanka Wildlife Health Centre and their corresponding tasks.

	Participants	Perspectives Demands, expectations, identifications	Situations Ecological or geographic info, temporal dimension, institutionalization, crises or intercrises	Base Values Values already possessed: Power, enlightenment, wealth, well-being, skill, affection, respect, rectitude	Scope Values Values sought/demanded	Strategies Diplomatic (negotiation), ideological (ideas), economic (goods), military (arms)	Outcomes Values accumulated or lost, decision choices	Effects Values accumulated or lost, institutional practices
DAPH	Upper	Sharing of info, Training & Lab work	Institutionalization, Crises, ecological	Power, skill, respect	Enlightenment	Diplomatic, Ideological	Enlightenment	Respect, Enlightenment, Wealth
	Mid	Reporting, Capacity building, Sharing of info, Better collaboration of data, formal procedures processes	Ecological, geographic info, temporal, crises	Wealth, Power, Enlightenment,	Enlightenment, Skill	Ideological	Skill, Enlightenment	Enlightenment, Skill
	Field	Training & Lab work, Better collaboration of data, sharing of info	Ecological, geographic info, temporal, crises	Enlightenment, Skill,	Respect, Skill	Ideological	Wealth, Skill, Enlightenment	Enlightenment, Respect, Affection, Skill
DWC	Upper	Better collaboration of data, Reporting	Institutionalization, Crises	Power, Enlightenment, Respect, Skill	Enlightenment, Skill, Wealth	Diplomatic, Economic	Enlightenment	Enlightenment, Wealth, Respect
	Mid	Training & Lab work	Ecological, geographic info, temporal, crises	Enlightenment	Skill, Respect, Enlightenment	Ideological	Skill, Enlightenment	Enlightenment, Skill
	Field	Sharing of info, Infrastructure, collaboration of data	Ecological, geographic info, temporal, crises	Enlightenment, Skill, Respect	Respect, Skill	Ideological	Wealth, Skill, Enlightenment	Enlightenment, Skill, Affection
FVMAS	Upper	Better collaboration b/w institutes, collaboration of data, formal procedures	Institutionalization, geographical info	Enlightenment, Skill, Respect	Wealth, Respect, Enlightenment	Diplomatic, Ideological	Wealth, Enlightenment	Respect, Wealth, Enlightenment
	Mid	Better collaboration b/w institutes, infrastructure, training & lab work	Institutionalization, Crises	Enlightenment, Skill, Respect, Affection	Enlightenment, Respect	Ideological, Diplomatic	Wealth, Skill, Enlightenment	Enlightenment, Skill
	Field	Better collaboration of data, sharing of info	Institutionalization	Skill, Respect	Respect, Skill, Enlightenment	Ideological	Wealth, Skill, Enlightenment	Respect, Affection, Enlightenment, Skill
MOH	Upper	Sharing of info, Better collaboration of data, formal procedures processes	Institutionalization, Crises	Power, Enlightenment	Power	Diplomatic	Enlightenment	Enlightenment, Respect
	Mid	Sharing of info, Better collaboration of data, Formal procedures & processes	Crises	Enlightenment, Wealth, Skill	Respect	Economic	Enlightenment	Enlightenment
	Field	Formal procedures & processes, Sharing of info, Better collaboration of data, Better collaboration b/w institutes, Capacity building	Crises, Ecological, Institutionalization	Enlightenment, Rectitude, Skill, Wealth	Wealth	Ideological, Economic	Skill, Enlightenment	Enlightenment, Affection

3.4.4 The Decision Process

Table 3.8 gives a breakdown of each individual decision function and questions that can be asked for each function. Assessing the performance of each function within the overall decision process can help determine areas where the SLWHC can make improvements (Clark 2011). These questions were used to guide my interpretations of each participant's response when analyzing data in NVivo. Based on all the data collected and the interpretations of my codes used in NVivo, the decision process is as follows.

Initiation: Officially on March 1, 2013 a collaboration between the SLWHC and the Canadian Wildlife Health Cooperative (CWHC) was formed to increase Sri Lanka's capacity in wildlife health management, funded by IDRC (Sri Lanka- a Renewed Partnership in Wildlife Health 2013). Sri Lanka is a biodiversity hotspot for flora and fauna. Wildlife hold a strong cultural, economic, and esthetic value to the 20 million people of Sri Lanka (Sri Lanka- a Renewed Partnership in Wildlife Health 2013). With an ever-expanding population, the cross over between humans and wildlife is becoming more frequent, and thus the chance of health issues, especially zoonotic, is of great concern. With the start of the SLWHC, other participant groups can benefit from training, resources, knowledge, and improved overall health capacity of humans, wildlife, and domestic animals. For my specific project, the Director of the SLWHC, along with the Principal investigator for the University of Saskatchewan, have been the ones coordinating this interdisciplinary collaborative project.

Estimation: Preliminary meetings of relevant participants groups (DWC, DAPH, FVMAS, and CWHC) took place over the summer of 2010 to discuss the possibility of establishing a national wildlife health centre in Sri Lanka (Valeix et al. 2011). Discussions took place of which participant groups hold a stake in the problem and who should be included and who shouldn't be. The groups that were decided on to be included were the CWHC, University of Saskatchewan, IDRC, SWLHC, DAPH, DWC, FVMAS, and MOH. The inclusion of the IDRC and MOH was determined based on the need to address significant program gaps that would have existed had they been excluded (Valeix et al. 2011).

Selection: In this phase, principal investigators and main representatives for each participant group corresponded to determine the best course of action to try and achieve goals. Individual projects were created inside of the main project, in order to achieve smaller goals, put

in place by individual participant groups. These individual projects represent the common goal that was established by all participating groups.

Implementation: In this phase IDRC oversaw progress of the project and had the ability to increase funding if goals were met. They were the organization that had ultimate control over the project and enforced the rules that were agreed upon for funding. However, the director of the SLWHC was the one who maintained relationships of all participant groups and was the one who coordinated meetings and day-to-day tasks. The director of the SLWHC made sure all disputes were dealt with in a timely matter so that progress was not halted.

Evaluation: To appraise the situation, interview questions were developed based on the integrative interdisciplinary framework. Interviews were conducted to the four main participant groups, DAPH, DWC, FVMAS, and MOH, who are part of the SLWHC. The purpose of the interviews was to determine gaps and opportunities in communication channels and wildlife disease surveillance of the SLWHC. After the responses from participants were evaluated and analyzed, recommendations and best practices were suggested, which can feed back into the implementation function. My project was but one of many project evaluation tools that was used to assess the SLWHC. Every year there was an annual review of progress reports conducted by the IDRC.

Termination: As of August 31, 2017, the funding provided by IDRC ceased and all the official matters were over for all of the projects which were associated with the SLWHC, this also included my research. All of the requirements for funding by the IDRC have been completed by both the Sri Lankan and Canadian counterparts. However, the SLWHC intends to continue to be up and running with new relationships being made.

3.4.5 Analyzing conditioning factors

3.4.5.1 Job security, hierarchy, class distinction

Inconsistencies in participant's answers were common when comparing them throughout their organization's hierarchy. When participants were asked what the role of the SLWHC is, the answers differed based on where MOH participants sat within the organizational hierarchy. At the field level of the MOH, one participant gave the following answer: *“coordination with the DAPH, DWC, and the MOH; do some research in the areas of wildlife with emphasis on the animal-human interface; receive information and inputs, definitely beneficial for future*

institutions” (15.08.18-001). When asking a mid-level hierarchy participant, the same question, the participant did not know what the role of the SLWHC is and do not have any idea about it (15.08.10-003). At the senior level the following answer was obtained: “*human-animal contact is quite frequent; how to reduce diseases getting from animals to humans is the objective of the global community today; so, from that aspect this is very important*” (15.08.19-001). These variations in answers from participants show that there is a problem with communication up and down a hierarchy within each organization. This can also directly impact dissemination of information and data. It should be noted that the variations in participant’s answers also show that participants all have different job responsibilities, therefore they have different knowledge and priorities, which can be reflected in their answers.

When participants would comment on processes and procedures, there were many irregularities in responses, especially in regard to where the participant sat in their organization’s hierarchy. One mid-level participant said, “*There is a set procedure that would be followed*” (15.08.14-002) while a field level participant said, “*There is no standard operating procedures, the formal link is not there*” (15.07.30-003). These inconsistencies show the requirement for increased knowledge and training about processes and procedures, especially in response to a disease outbreak, throughout the hierarchy.

One participant stressed the need for communication, collaboration, and information dissemination down the hierarchy, making sure it reaches the grassroot level. Since the majority of the grassroot level people are the ones out in the field conducting wildlife disease surveillance, it is pertinent that they are provided with up to date information of what they should be looking for and focusing on.

Right now they (MOH) just ignore the wildlife as a potential source of disease, so especially the public health people should be more aware of this, the vets and the lay people should be more aware of the wildlife diseases and possible threats and as the health centre we should create communication links and the official level and at the grassroot level for all this public and lay people and vets and wildlife people don’t collaborate. (15.07.23-003)

One participant from the FVMAS said that they have good communication in their organization’s hierarchy, “*every organization has a hierarchy level and within those organization they have good communication. Within the faculty there is good communication, good*

communication with the dean and head of departments, academic staff and non-academic staff” (15.07.23-001).

It is also essential for communication and collaboration to happen across levels, such as the grassroot level, so that everyone can be well connected and on the same page. *“I think at the higher level there is good connection, but when it comes to the ground level I don’t know”* (15.07.23-002).

When participants were asked from whom they would like to receive information regarding wildlife disease surveillance if a disease was detected, participants from the FVMAS said they would like to hear the information from either scientists directly involved with the SLWHC, the DWC, the DAPH, the MOH or from any knowledgeable source with a certain level of expertise in the related area. This participant is closing themselves off from potentially receiving more data and information than if they opened communication channels up to a wider audience.

3.4.5.2 Resources and funding

A DAPH participant talked about the need for money to perform wildlife surveillance on a continual basis,

Surveillance is a continuous process, so for that we have to spend lots of money and it is an ongoing thing, so it is not like single disease investigation. It is a continuous process, mainly in any country surveillance we do for the main important diseases, that may be economically important or maybe if it has a zoonotic impact such types of diseases, we do surveillance (15.08.12-006).

Nine participants talked about the difficulty they have when trying to do wildlife disease surveillance due to the lack of resources. It was stated by 47% of participants that considerable resources are needed for wildlife disease surveillance, in the form of material and people to conduct proper surveillance. 20% of participants also indicated that the commitment of people is essential. *“The most important thing is to change people’s attitudes to give information, it has to be very specific to give info to who, what telephone number. There are more mobiles than people here”* (15.07.24-001).

At present I cannot say these diseases or animals should be focused on because we are at very limited surveillance, so we don't know which animal diseases are more dangerous because we don't have evidence. So, have to establish a surveillance system so they can say if a certain area is more prone to wildlife diseases or zoonotic diseases, if an animal transmits more viruses or bacteria. Dogs are the easiest to catch so they are the ones who are tested for rabies, other animals like jackals and civets are very hard to catch in the wild so there are no samples collected there in regard to rabies. So, we don't know which animals have more rabies or leptospirosis (15.07.24-004).

Budgets are a main concern of every organization,

There should be continuous inflow of carcasses from wildlife to the center VIC, once they open the carcass, they should send samples to all respective specialists for further investigation. At the termination of the current grant, every department should have the capacities to cover the financial needs, so it should be engraved into their routine budgets (15.07.24-002).

Participants were asked what they thought other participant's roles should be, in terms of wildlife surveillance. Participants talked about the necessary resources that are needed to conduct wildlife disease surveillance. One participant suggested that since the DAPH has lab facilities and human resources, they should be mobilizing their resources in order to collect information and analyze samples (15.07.24-004). The same participant also said it would be good to have a database that the DWC and other participants could benefit from (15.07.24-004). The SLWHC's lack of infrastructure directly impacted its ability to have resources that are readily available by each participant group. It also impacted the ability to communicate between participant groups. The following participant talked about how good communication is between participant groups, and the impact infrastructure and resources play. *"Somewhat good, but the thing is the lack of infrastructure and lack of staff that we are facing to develop that communication"* (15.08.10-001). The geographic location and distance between each participant group also posed a problem. This requires the potential need for more resources, such as lab facilities, storage for samples, and databases distributed to each of the four participant groups.

Another DAPH member addressed the problem of carcass storage and the policies to do with carcasses, this individual suggested that the ability to handle wildlife carcasses should be given to government vets and veterinary investigation officers (VIOs), as currently the responsibility lies solely with wildlife officers.

One participant voiced their specific concerns surrounding the SLWHC,

We don't have many staff for the SLWHC, there is no physical SLWHC, morally that is a problem for some people, in the Sri Lankan context some people need to see it in order to see if it is working, so that's a problem. The sustainability of the SLWHC is a problem, one thing is financial and staff, the staff should have proper training, therefore it should be started now. The other stakeholders might think they should be provided with more infrastructure than this and they need some more training probably, but for a starting point like this they should be quite satisfied for what the SLWHC has done so far (15.07.23-003).

When participants discussed what the DWC's role should be in terms of wildlife disease surveillance, very few answers were recorded. One participant said that the DWC should be in the forefront for wildlife disease surveillance, *"main thing should be done by the DWC and the other 3 stakeholders should be side support, by doing propaganda, making people aware, safety precautions should be done by the other stakeholders"* (15.07.24-004). However, the DWC has limited resources to play such an independent active role *"Wildlife conservation has a minimum number of employees and we have very limited human and physical resources. DWC has main role in collecting samples and acting on results in regard to their own role"* (15.07.24-004). The DWC also has limited time and means to do the proper surveillance by themselves. Another member of the DWC shared a completely different view of their role, describing their role: *"in our organization there are no good surveillance programs, but not much surveillance program is conducted in the wildlife department. Normally we are doing treatments and treat animals, management, and those things"* (15.08.19-004). One participant from the DAPH discussed that they lack the support in the form of resources and manpower, and that they need the help of the MOH and their resources for wildlife disease surveillance, especially in regard to zoonotic disease (15.08.17-001).

3.4.5.3 Knowledge and Enlightenment

When looking at the social process table (Table 3.8), enlightenment was a base and scope valued that was observed throughout the hierarchy of the participant groups. The ability to obtain and further one's knowledge was a conditioning factor that impacted many trends.

A participant from the DWC said that they have no power to coordinate public health, therefore the MOH should be involved, especially because the general public may be more willing to listen to someone if they are from the health sector (15.08.19-002). This suggests that the public's knowledge regarding zoonotic disease needs to be increased. Interviewees identified the importance of reaching out to more of the public and educate them on the present issues that could affect their health and livelihood. *“Important for the concept of One Health, it will predict and give some early warning, what is going on at the wildlife health and its possible effects on the health of domestic animals and humans”* (15.07.28.001).

When asked “what do you think your organization's role is in wildlife disease surveillance?”, participants either described their role as minimal, no role at all, or that they do have a significant role to play. When a participant described their role as minimal, they meant that their organization participates in wildlife disease surveillance, but at a limited level. The extent of their role was determined after further questioning on their participant group's level of involvement. A participant described their part as playing no role at all means that they did not think their organization role is mandatory in wildlife disease surveillance. When a participant indicated that they do have a significant role to play in wildlife disease surveillance that meant that they think their organization should be actively participating in wildlife disease surveillance. Seventeen participants answered this question in full. Table 3.9 summarizes the responses obtained from the various participant groups. There was a variety of inconsistencies in the responses to this question. This indicates a need for participants to become more engaged and gain knowledge regarding their organization's role in wildlife disease surveillance.

When participants were asked how they thought other participants view the role of the SLWHC in wildlife disease surveillance, very few participants answered directly. Seven participants (41%) actually answered if the SLWHC is doing a good job or not, while the remaining 59% avoided answering the question. Two participants said they had no idea, three said they are doing their job, one said no, and one said they are sort of doing their job.

I think this is the first time we are having this kind of connection between the wildlife, domestic animals, and human health but they are starting to understand the importance but in the past they have not been very closely involved with this activity, so I hope they will do so in the future (15.07.28-001).

One member from the MOH did not think there was even a SLWHC established, “*So the SLWHC should be established first, then only you can say if they are correctly communicating* or not, as far as I know there are no such centers yet, so how can I answer that question” (15.07.30-002).

Table 3.9. Responses from each participant group describing their role in wildlife disease surveillance.

	Minimal Role	No Role	Significant Role
DAPH ¹	2	1	2
DWC ²	2	0	2
MOH ³	2	0	1
FVMAS ⁴	0	1	2
Other	1	0	1

¹ Department of Animal Production and Health

² Department of Wildlife and Conservation

³ Ministry of Health

⁴ University of Peradeniya Faculty of Veterinary Medicine and Animal Science

When participants were asked are there any participant groups/agencies/non-government organizations (NGOs) who aren't involved with the SLWHC who should be, there was a range of responses (Table 3.10). The bolded names in Table 3.10 were mentioned by more than one participant. NGOs were a very controversial inclusion by participants.

A participant showed hesitation about the inclusion of NGOs, *"I don't have any experience with working with NGOs, so I don't know whether it will function."* (15.08.12-006). *We can work for their projects, but for them to be involved there would be a lot of paperwork because they aren't government organizations."* (15.08.12-001). This reluctance to include outside participants shows that the potential for expanding interdisciplinary collaboration may have limits, however the potential is still there. If participants are willing to include outside participants, there is a potential to learn from outside sources who will have fresh insight.

Many participants were supportive of the idea of including outside participant groups who aren't currently part of the four main government participant groups of the SLWHC. One participant thought the inclusion of NGOs would be beneficial because they don't have any limitations (15.08.18-002).

When asked if a disease were detected, what information would your organization want to know about wildlife disease surveillance, participant's answers were generally consistent. Participants started out by saying they would want to know the basic epidemiological data: when and where carcasses were found, how many animals were affected, which species were affected, age of animals, how the animals died, and any other relevant history they could get. Participants would then like to know of any other possible signs of outbreaks, any other animals in the same area with the same signs. The environment of the species affected should be noted, to know the possible contamination system. The season is also important, as it could indicate if there is a higher chance of transmission of disease. The frequency of contact with domestic animals, as well as humans should be noted, so relevant participant groups can be involved. Behavioral changes could be a major clue as to the cause of the outbreak. If possible, participants would like to know how many sick or dead animals there was in the area affected throughout the year and previous years. With this information relevant participants could then answer the following questions. What is the agent, how are they going to control the agent, how are they going to stop the disease from spreading, what measures should they take to prevent the disease from spreading?

Participants were eager for as much knowledge and enlightenment as they can obtain. The incorporation of new participants could open up communication channels, potential collaborative projects, and additional resources.

Table 3.10. Potential participant groups/agencies/non-government organizations (NGOs) suggested to be included with the SLWHC, as stated by study participants. Bolded names were suggested more than once by different participants.

Young zoologist association (n=2)	Local Government (n=2)	NARA ⁴ (n=2)
NGO ¹ (n=6)	Local Administrative People (n=4)	NADA ⁵
Faculty of Science	Politicians	Animal Welfare/Protection Groups (n=2)
Department of Zoological Gardens (n=3)	Government Administration or AGA ²	Village level/Public/Mayor
Department of Forestry (n=3)	UNDP ³	Ministry of Education
Ministry of Agriculture	Biodiversity Secretariat	Livestock Sector
Born Free	Photography	Sri Lanka Wildlife and Natural Protection Society
Media (n=3)	Nature Protection Society	Customs
Police	Ministry of Environment	

¹ Non-government Organization

² Addition Government Agency

³ United Nations Development Programme

⁴ National Aquatic Resource Agency

⁵ National Aquatic Development Agency

3.4.5.4 Respect and Organizations

When looking at the social process table (Table 3.8), respect was a base and scope valued that was observed throughout the hierarchy of the participant groups. Some participants answers were interpreted as them seeking respect for their organization. It was determined that some participants thought that their organization was the answer to conducting wildlife disease surveillance. Their responses lack an interdisciplinary approach, which the SLWHC was trying to implement. It was mentioned from two participants that in wildlife health surveillance the DAPH had to involve all the field vets. *“The DAPH is a major stakeholder to improve wildlife disease surveillance.”* (15.07.30-004). Some participants made other suggestions on specifically how that communication should be conducted, *“DAPH should be the center person, they have direct contact with the faculty and with the DWC, have some contact with MOH”* (15.07.23-001).

One member from the DWC said that they should be the main participant group for collecting data, even though they lack the resources to facilitate this. One member from the DWC described their role as:

We are the main stakeholder I think for collecting data, because we are the people who have the authority to go into the conserved areas, so they approach the wild animals, the most and see the disease and some different and changing patterns, so those people easily collect data and samples. So, I think the DWC should be the main role in collecting the data, samples, and providing the information of changing patterns of behavior of animals, outbreaks, and individual samples. This should be done by the DWC, other than that there should be a system to collect the sample and send the sample to the lab in the DAPH or MOH (15.07.24-004).

DWC they are the main authority for wild animal, conservation and protection from the public and from the villages and providing them feed and control the village animals, etc. We are very confident for them to investigate disease and epidemiologist studies and come up with some action plan to promote the safety for wild animals. (15.08.14-001).

The following participant from FVMAS discussed how he was a major component of why his specific department communicated so well. He stated their *“department is few people, the moment he gives a phone call/text message/email, everyone comes within 30 minutes. 30 minutes is enough time to disseminate information”* (15.07.24-001). He said that their communication is awesome (15.07.24-001).

We talk about it lots. We have our regular technical meetings. Now we have different committees and meetings for rabies and influenza. So, they also individually discuss those, in addition there are a lot of forums where we talk about One Health and zoonotic. Even One Health we have a One Health hub also, so those sorts of mechanisms are there and we discuss those things. Wildlife comes into the picture not that often compared to the animal health, the livestock and those areas. Even rabies the thing is that at the moment our issue is the dog rabies. More than 95% is through dog bites and even our control on given days is strategies based on giving dog vaccination at the level of 70% for herd immunity. So, once I think wildlife to human is not much, so I think most of these areas we have a system and the wildlife also gets involved if and when necessary. The DAPH and the wildlife have to work together to prevent the domestic animals from getting it from the wild and, but I feel that's also an important area. Even though the elephant human interface is there, because sometimes deforestation you get humans coming into contact with them and this is an area that also needs to be developed (15.068.18-001).

3.4.5.5 Conflict within or between organizations

Conflict within or between organizations was a conditioning factor that impacted trends. A participant from the DAPH suggested how existing conflict between their organization and the DWC impacts communication and collaboration. *“DWC there is very little interactions, even though we should have a very close link, but the links are very weak to me.”* This participant attributed these weak links to the lack of staff at the DWC and the possibility of internal politics (15.08.14-003).

When participants were asked what role, their organization played in wildlife disease surveillance, some participants were quick to deflect responsibility onto other participant groups. A member of the DAPH said, *“it is not a mandate to us, the mandate to the wildlife department and they have a couple of vets also”* (15.08.14-002). Another MOH participant said, *“We do only human disease surveillance (15.08.19-001).*

I think the faculty of vet medicine and animal science don't do anything for wildlife surveillance but produce vets for the country and in our organization, we learn about the wildlife management, zoological management and wildlife medicine, that's the main role of the faculty. We don't handle much more about wildlife surveillance (15.07.23-001).

When participants were talking about the relationship between the DAPH and DWC there was some underlying conflict between the two organizations that was present. One participant

from the DWC said that the DAPH is important for diseases that affect domestic animals, such as foot and mouth disease (FMD), and if there is a certain case where the DWC should have to vaccinate livestock, it is essential that they have their support (15.08.10-001). It is known by participants that the DAPH's primary role is to focus on domestic animals and livestock, but one participant from the DWC said they have asked for help from the DAPH regarding wildlife disease in the past, when they felt their own vets could not engage (15.08.18-002).

Most participants addressed the inclusion of NGOs with the SLWHC, but only seven participants actually thought it would be a good idea, while two outright said it was not a good idea and six participants were unsure. Two participants stated that *"Sri Lanka NGOs are not technically sound"* (15.07.30-003, 15.08.19-001). One of those participants said that they should not be included with the SLWHC (15.07.30-003). Another participant said *"NGOs are usually concentrated to one animal. So, to involve NGO's is somewhat difficult because you cannot specifically say which one."* (15.08.10-001). *"Getting the NGOs will be a little bit of a problem because these are all government organizations"* (15.08.12-001). Another participant spoke from past experiences with NGOs, *"there are some NGOs involved in the rabies and they don't allow us to do anything. If we catch the dog they shout, our handling is bad, but then you can't control the rabies."* (15.08.14-001).

A participant from the MOH said they only receive their information from the hospital.

CHAPTER 4: DISCUSSION

4.1 Synthesis and Review

The common interest shared by study participants is to develop a cooperative strategy by combining resources, knowledge, and trained professionals to decrease, and prevent the incidence of zoonotic disease outbreaks that occur between Sri Lankan people and wildlife. Major differences are apparent between each participant groups' understanding of what is most important in regard to opportunities for the Sri Lanka Wildlife Health Centre (SLWHC). These differences in perspective could be based on each individual participant groups having a different focus and/or limitations based on their organizations' area of expertise (Schwind et al. 2014). Participant groups perspectives emphasized the current level of dissemination and collaboration of data, processes and procedures within participants organizations and in response to a disease outbreak, how communication should be conducted within or between participant organizations, the level of training, and infrastructure.

4.2 Projecting developments

By taking into account the trends and conditioning factors that were analyzed from participant group interviews, various scenarios can be projected. If the SLWHC does not continue to evaluate progress regarding their common interest on a regular basis, it would be easy to slip back into a regressive pattern in decreasing and preventing zoonotic disease outbreaks. If the incidence of wildlife disease begins to increase because of it, key industries for Sri Lanka could suffer, such as ecotourism. Increases in zoonotic diseases pose an increased threat to human and animal health. If communication between participant groups is not made a priority, the interdisciplinary relationships that have been established between the Department of Animal Production and Health (DAFH), Ministry of Health (MOH), Department of Wildlife and Conservation (DWC), and University of Peradeniya Veterinary Medicine and Animal Science faculty (FVMAS) could suffer and conflicts between them could increase.

Currently, the Director of the SLWHC is acting as a connecting node and is the one maintaining the relationships between all the participant groups. Many relationships that currently exist between participants and participant groups are in place because of this person. The director is the one that facilitates all meetings, workshops, and lots of the interactions that go

on between participant groups. Once this individual retires it is unknown what will happen to the existing channels that have been developed. It is possible that participant groups are more eager to participate in the SLWHC if this person remains the node of contact. This person is highly respected, has a diverse background, and has a vast network of contacts. Therefore, once this person is gone someone else will have to step up to the plate to satisfy this role, otherwise collaborative efforts made by participant groups will fall short.

If communication between participant group's hierarchical levels does not improve, knowledge translation will continue to suffer and the disconnect between the level of organizations will worsen. This will hinder the bridge between animal and human health that has been strengthened by the SLWHC. Without a strong relationship between human and animal health the flow of information and collaboration between participant groups may decline further and public knowledge and awareness about zoonotic disease could decrease. The SLWHC provides opportunities for all of the participant groups to share resources, knowledge, and increase training opportunities. The SLWHC also provides an outlet for increasing public awareness and knowledge about zoonotic disease.

4.3 Recommendations

4.3.1 Inventing, evaluating, and selecting alternatives

If the trends that are occurring are not moving towards the common interest, then a problem exists and action is warranted (Clark 2011). Below are recommendations specific to the SLWHC and the participant groups involved. Alternative courses of action are then provided that can be implemented to meet the common goal of participants.

Alternative 1: Improve data sharing and collaboration between each participant group and outside parties

Participants stated that the level of communication needs to increase between participant groups. When participants were asked about the level of communication, they have with other participant groups, 63% said that communication was insufficient. It was acknowledged that since the start of the SLWHC communication has improved, but participants stated that it is still less than ideal. Communication levels were unsatisfactory when participants were asked if they

would contact the other participant groups in the event of an outbreak. Participants were also unsure who they should contact in the event of an outbreak.

There seems to be issues regarding power and respect. Currently, the SLWHC's communication is contingent on one person's key involvement in coordinating the meetings and collaboration that occurs between the participant groups. This person has a vast network of contacts and is a highly respected individual. However, if this participant steps down from their role it is possible that relationships and communication channels will cease to exist. It is proven that individuals who bridge nodes within a network and connect various participant groups are crucial for enabling the movement of information (Burt 1992; Kapucu 2006). These actors often have access to various information and resources that can benefit other participants further than the participants can get from within their own organization (Bodin et al. 2006). Therefore, it is crucial that the SLWHC strengthens communication channels and nodes of contact within each participant group, so that the success of the SLWHC is not contingent on the presence of one specific person.

Other participants said that communication only occurs between participant groups under special circumstances, such as in the event of an outbreak. Communication should be flowing continuously between participants for knowledge and data transfer, and to be prepared in the case of an outbreak. Networking is a crucial factor in the building and sustainability of surveillance, as well as the ability for response for disease (Stallknecht 2007). If sufficient trust is not present in everyday communication, the validity of the information given in the event of a crisis may be compromised. Trust is an imperative factor when it comes to building relationships between participant groups (Faas et al. 2017). There are two variables that can be attributed to the acceptance of procedures by participants, understanding of techniques, and trusting the people who are executing the procedures (McCaffrey et al. 2013). Some participants are selective about who they would like to receive information from, thus being suggestive of only trusting a select few individuals, and/or having pre-existing conflict with certain individuals or organizations. Therefore, existing relationships need to be maintained in order to facilitate communication on a regular basis, but trust and respect need to be established between organizations to generate better communication. In the case of a crisis situation such as a wildfire, participants must work collaboratively to efficiently respond to the threat, bridging participants is a vital part in the response (Faas et al. 2017).

Base values such as power, wealth, and respect can pose risks to the efficiency of communication (Mattson 2014). When evaluating the social process table (Table 3.8), power, wealth, and respect are base values that frequently show up. Respect is observed in all 3 levels of the participant groups. Power is more prominent in the upper levels of the participant groups. Problems associated with power can happen when the content of communication is adjusted on purpose to conform to an ideology or counter-ideology (Lasswell 1948). Wealth seems to be a more common concern for the mid-level DAPH, and mid and field level of the MOH. Distortions associated with wealth can happen if participants have set notions of economic interest (Lasswell 1948). Improving communication between participant groups will only be effective if respect and trust are established at the same time.

Data sharing was a trend that was frequently observed with participant groups. Currently, there is a lack of data sharing that is not considered sufficient by the participants. If all participant groups had access to a universal database that they were proficiently trained on, it would provide a resource that they all could access and contribute data to. In order for this to happen, there needs to be adequate funding to have a database installed for each participant group, or if there was a physical space where participants could travel to, to meet with each other and collaborate on data. Scientific papers provide an excellent means of reporting information and is an important way to communication worldwide (Ryser-Degiorgis 2013).

Recommendations

1. Participant group panels could be established to discuss issues of importance from each participant's viewpoint (Jeffery 2009). This can help participant groups stress points of concern with each other and build trust and respect within the SLWHC. If participants feel like they have a channel to communicate issues properly, potential conflict can be avoided.
2. Workshops could be held, focusing on maintaining and building future relationships with relevant interdisciplinary participant groups (Clark et al. 2009). Workshops can provide a formal means of increasing networking between organizations. They also stimulate communicate flow as participants are present based on a common goal.
3. Implementing the usage of a universal database would allow for the collaboration between participant groups to catalog important details regarding wildlife disease across

the country. In the case of the CWHC database, it makes data sharing simpler between wildlife disease managers, researchers, and other participants and partners (Wildlife Disease Database Overview, n.d.).

Alternative 2: Improve internal communication and sharing of knowledge within the hierarchies of participant groups

One of the most common scope values sought by each participant group was enlightenment. Enlightenment, which is to gain knowledge (Clark 2011), was a scope value that was considered important throughout the hierarchal ladder of all four participant groups. In order for rational choices to be made in a democratic society, enlightenment is needed, which is then dependent upon communication, especially throughout each hierarchal level of each participant group (Lasswell 1948). The desire for more knowledge was valued by all participant groups as a base value. The only group that did not identify enlightenment as an important scope value was the MOH.

Even though enlightenment is an important base value, there were still a large proportion of participants that said they were unsure of communication levels, or that communication levels were insufficient. Participant groups may be hesitant to have open communication channels for knowledge sharing, due to fear that specific channels could be exploited and knowledge could be suppressed, creating secret surveillance (Lasswell 1948). If a participant group or individual, responsible for collecting and distributing pertinent information is lacking the appropriate training, they could repeatedly overlook key points that are crucial for achieving a common goal (Lasswell 1948).

It is crucial for participant groups to focus on sharing information within their own organizations. Due to the functionality of participant organizations, individuals share information upward in the hierarchal ladder, but information flow down the hierarchal ladder may not be considered satisfactory at the mid or field level (Rawat, n.d.). For the SLWHC it is extremely important that information flows down the levels, especially in the case of wildlife disease surveillance. The grassroot level contains the participants who are out in the field collecting data and samples. If the grassroot level fails to receive the proper information regarding each specific situation, efficiency and accuracy of reporting critical information, especially regarding

surveillance, can be comprised. To remedy this, it is important for upper level participants to communicate with the mid and field level participants within their organization to remain focused on the common interest and continue to be conscious about the importance of enlightenment as a base value. In order to address the common interest, the upper levels of the participant groups need to set a good example, and communicate with the rest of their company, in order to best utilize expertise and specialties that are present within each participant group. Inefficiencies in communication can occur when an upper class participant mixes only with people on their own level, therefore forgetting to adjust their perspectives by exposing themselves to participants at other levels (Lasswell 1948).

Recommendations

1. Implementing the usage of educational materials, such as scientific publications, brief reports, brochures, and information leaflets to increase awareness (Gilbert et al. 2014), will help with the dissemination and collaboration within participant groups, and other interested parties.
2. Expanding the network to outside parties would allow participant groups to gain more enlightenment or knowledge from different perspectives, by opening new communication channels that were not present before. It would also allow for the potential for an outside party to help participant groups obtain resources that help sustain their operations and adapt to continual changing circumstances (Longest and Rohrer 2005).

Alternative 3: Establish and/or strengthen current formal procedures and processes within organizations and as a collective for the SLWHC

Many inconsistencies were observed regarding participant's knowledge on procedures and processes within their own organization. Some participants, usually those who are higher up in the organizational ladder, knew about formal procedures and processes that were put in place for their organization. In contrast, participants at the grassroots level had no idea about what procedures and processes were to be followed with respect to communication, collaboration, and data sharing, especially in the event of an outbreak. This discrepancy indicates that information is not flowing down the levels and that participants throughout the organizations need to be aware

of specific mandates that their organization has. When participants were asked what their role was in wildlife disease surveillance, many participants did not know their organization's specific role. Some participants would pass the responsibility onto other organizations and say that the mandate specifically only regards them. These discrepancies in knowledge require clarification at both the level of each individual participant group, as well as for the SLWHC as a collective. If they are at an appropriate standard and support their organization's common goal, they then need to be distributed across organizational levels.

Participants need to be clear what their individual role is in wildlife disease surveillance, as well as their organization's overall role. Lessons taken based on good practice from other government agencies such as the forest and game management industry can be applied, where the focus was on verification of good practices, not just focusing on opinions, that have been tested, improved, and applied following adaptive management principles (Brink et al. 2011). Good practice in interprofessional collaboration (IPC) in the public health field requires participants to work jointly with open minds and to also value what each participant brings to the team (Green and Johnson 2015). Participant groups need to determine what their organization's common goal is, look at what they already have put in place, and then start addressing any gaps that are present.

When participants were asked if they would contact any other participant groups in the event of an outbreak, and who specifically they would contact, there was a range of answers. Participants need to be aware of standard processes and procedures that are required in the event of an outbreak. Participants need to know what participant groups need to receive information, who are the nodes of contact, what information they need to receive, and in what form. Participants need to know how inclusive they need to be with other participant groups. If there are set processes and procedures in place for the event of an outbreak, they are ineffective if participants do not know what their specific role is and if they are not strengthened for the future. Implementing a well-defined set of certification criteria will help enlighten and educate all participants involved about what is required for sustainability within the SLWHC, but also to learn about shortcomings within their own participant groups and others (Brink et al. 2011).

With the SLWHC now established there need to be set processes and procedures that are put in place as a collective group with the integration of the DAPH, DWC, FVMAS, and MOH. The Director Generals (DGs) need to set the overall tone by establishing a mandate for strategy for the development of formal processes and procedures. This will enable each organization to

mobilize resources to achieve the common goal. Having the DGs setting the “tone from the top”, helps establish the development of an engagement strategy between participant groups (Jeffery 2009). Trust needs to be built between the participant groups, which can help understand their viewpoint and goals (Jeffery 2009).

Recommendations

1. The implementation of focus groups that are tailored to different parts of the integrative interdisciplinary framework , i.e. standpoint clarification, problem orientation, social and decision process mapping, could help improve or develop future programs specific to achieving a common interest (Rutherford et al. 2009). A common interest needs to be established to devise processes and procedures for the SLWHC as a whole. This common interest should align with the SLWHC’s vision statement, “*to coordinate the operation of a National Wildlife Health Program (NWHF) in Sri Lanka, aimed at preventing, detecting, and managing disease in wild animals, and reducing the risk of inter-species transmission of pathogens, including those that are communicable to humans and domesticated animals*” (Sri Lanka Wildlife Health Centre- An Inter-institutional Partnership, n.d.).
2. Feedback loops provide a good starting point to support learning and communication. They can eventually help lead to sustainable management, however they should be followed up with more comprehensive operational models (Brink et al. 2011). Feedback loops can help establish new processes and procedures that could work for the SLWHC. Participants and participant groups could give feedback on a continual basis on new processes or procedures that have been implemented to assess their functionality and sustainability. This would allow participant groups to tweak current process and procedures to make sure that they are accomplishing the specific goals set.
3. Capitalizing on internal and external experts (Manela and Moxley 2002). By using the expertise and knowledge of participants within their organization, participants can feel like they are respected and contributing to the bigger picture of the SLWHC. Organizations can benefit from asking for participant’s input in what they feel is important and if anything, else should be included in mandates regarding their organization’s wildlife disease surveillance strategies.

4.4 Conclusions

The problems that the SLWHC faces exist in a unique context but similar problems can and do occur worldwide in developing and developed countries. Nevertheless, the SLWHC provides a good prototype that will build capacity to do more between future and existing interdisciplinary relationships. My research has created a starting point for the SLWHC to plan and prioritize on where to expand their capacities, resources, knowledge, and personnel. The SLWHC provides an opportunity to bridge the gap between human, wildlife, and domestic animal health, therefore the long-term stability of these new interdisciplinary relationships is crucial. It provides a platform for participants to collaborate on issues that impact all of their organizations, as well as Sri Lanka as a whole. It also provides the opportunity to educate the public and producers to increase their awareness about zoonotic diseases and provide them with the ability to contribute to wildlife disease surveillance.

The SLWHC is a good foundation for future collaborative work between participant groups. Its One Health interdisciplinary approach of connecting the wildlife, domestic animal, and health sector is crucial in establishing a solid foundation and relationship between participant groups. However, communication and formal relationships need to be maintained and broadened to achieve an interdisciplinary approach. There should be a focus on sharing and dissemination of information, especially scientific findings within participant groups, and to other participant groups or relevant participants. Participants need to focus on sharing data that is relevant to participant groups. The SLWHC needs to continue moving forward, the common goal should be reevaluated on a frequent basis, to make sure all participant groups are still interested in the same outcome.

When addressing a problem, the first prerequisite is to find a framework that can be used to break down data and patterns regardless of ones' disciplinary approach (Clark 2001). The integrative interdisciplinary framework served as a tool to identify gaps and opportunities that the SLWHC should focus on to achieve their common goal. If the SLWHC needs to re-evaluate their common goal the decision process will have to be revisited, therefore producing different aspects of the social process.

By clarifying the common interest among participant groups, a targeted approach to the problem at hand can be put in place. When taking into account the social process table (Table 3.8), each participant group, and hierarchal level of each participant group, has specific base and

scope values that they are respectfully looking for. By adapting an interdisciplinary One Health approach based on a common goal, participant groups will be able to concentrate on advanced capacity building actions (Schwind et al. 2014). By finding a policy that takes the common interest into account the policy can then be implemented (Clark 2001). In this specific case, the SLWHC is looking to decrease and prevent the incidence of zoonotic disease that occurs between wildlife and people by implementing a cooperative strategy that combines resources, knowledge, and trained professionals.

The integrative interdisciplinary framework is a useful tool to organize thoughts, knowledge, and problem solving efforts in order to better understand and resolve a policy problem a researcher may face (Clark 2011). The integrative interdisciplinary framework has been widely used throughout the policy sciences to help tackle conservation issues for many different wildlife species conservations. However, my research is unique in the sense that it adapted the integrative interdisciplinary framework at the nexus of wildlife, domestic animal, and human health where it has not been previously used. It was used to determine gaps that were present in knowledge, structure, and communication with participants of the SLWHC. Other researchers have looked at accessing gaps in knowledge, i.e. how cystic echinococcosis affects livestock and public health in Iraq (Abdulhameed et al. 2018), but have not applied the integrative interdisciplinary framework to develop recommendations based on common goals between participant groups at the human-animal-wildlife disease interface. The SLWHC can take this information and apply it to any existing problems, and any future problems they may face, to continually reassess common goals between participant groups and for the SLWHC as a whole.

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APPENDIX A

Survey Questionnaire.

Date	
Time Started	
Time Ended	
Interviewee's Name	
Location	

Part 1: Background Information

Name	
Gender	Male / Female
Job Title	
Organization	
Is the organization government, non-profit, private or other?	Government Nonprofit Private Other
Number of years in position	
Number of years within organization	
Organization mission statement	
Services provided for public and communities	
Services provided for other organizations	

Interview Questions

Main Research Objectives

1. Determine the existing communication channels regarding wildlife disease surveillance, within and between participants of the SLWHC.
2. Advise the SLWHC as the best way to communicate within and between participants by comparison of the CWHC
 - Create a proposal for the SLWHC containing gaps, recommendations, etc.
 - Proposing a more effective governance system

4 main participants groups involved in the SLWLC: DAPH, University Veterinary Faculty, Ministry of Health, DWC

- i. Tell me a little bit about your background. (Qualifications/ Experiences)
- ii. What are some recent developments in your field of work?

Wildlife Disease Surveillance

1. What is your understanding of the role of the SLWHC?
2. What do you think your organization's role is in wildlife disease surveillance?
 - Are you involved in a wildlife surveillance system?
 - How effective are they
3. What is the role of a wildlife health surveillance system?
 - How do you think a wildlife health surveillance system should be working?
4. What do you think other participants' roles should be, in terms of wildlife surveillance?
5. Are there any participants/agencies/NGOs who aren't involved with the SLWHC who should be?
6. How do you think other participants view the role of the SLWHC in wildlife disease surveillance?
 - Are they doing their job?
7. What specific problems should be focused on in regards to wildlife disease surveillance?
 - What kind of diseases?
 - What kind of animals?
 - In relation to their particular area of work

8. If a disease were detected, what information would your organization want to know about wildlife disease surveillance?

- In what form would it best be received?
- Who would you want to receive the information from?
- Who do you think the information should go to?

Communication

9. In what capacity and what type of contact do you have with the other 3 participants?

- Meetings/conferences?
- How frequently?
- How they feel about the level of contact? Are they happy with or without contact

10. In the event of an outbreak would you have any contact with the other 3 participants?

11. How good is communication between your organization and other participant groups?

- Rank communication between each individual participant groups on a scale of 1-10
 - 1 being no communication at all
 - 5 being moderate communication
 - 10 being ideal communication (communicate every couple days)
- Which organization would you like to see improved communication with?
- Who do you contact specifically from each participant group

12. How good is communication within the organization/company regarding wildlife disease?

- How often is it talked about
- What type of communication?
- How much?

13. If there is a disease detected or if there was an outbreak, what would you want to happen within your organization regarding communication?

- What is the procedure/process that would be followed
- How would reporting occur
- What would you want to happen in terms of surveillance?
- What information do you want regarding that outbreak?
- Who should be receiving that information within your organization?
- In what form do you want that information?
- From who do you want that information?

APPENDIX B

Participant Consent Form



Defining Best Practices in Wildlife Agency Management in Sri Lanka and North America

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Research Purpose and Objective:

The purpose of this research project is to develop a sustainable best practice model of a governing structure for the SLWHC. This project was funded by the International Development Research Centre (IDRC). This model will be developed off information obtained from these interviews, and will be based off other successful national wildlife health centers. This new structure for the SLWHC will help mobilize knowledge on a local and global level. The model will facilitate cross-sectoral mobilization of knowledge into both policy and management decisions. It was also be a valuable tool for developing wildlife health capacity in other countries.

Participation:

Your participation in this study is solely voluntary. If you do not wish to participate due to your own reasons, you can politely decline. If you do wish to participate in our study it is greatly appreciated. If after you agree to participate in the interviews, you can withdraw from the study at any time with no reason of explanation. Once again, this is not mandatory and you should not feel obliged to answer all or any questions at all, but any information you can provide us with will be appreciated. Your personal information will not be revealed in any of our reporting of data.

Interviews:

The interviews will range in time, but will be dependent on how long you are willing to answer questions for. The interviews will be audio and video recorded. Interviews can be conducted either by myself in English, or by a research assistant in your native language. Whatever makes you more comfortable is perfectly fine. If you have any further questions regarding the format or how the interview will be conducted, feel free to ask myself, or one of my research colleagues.

Confidentiality:

Your participation in this research study will be 100% anonymous. We will not reveal your name or any of your personal information at any point in our study. Your name will be replaced with unique identification numbers, after which your name and personal information will be destroyed. You can have the upmost confidence in us that we will abide to this confidentiality agreement that you will sign if you decide to consent to our study.

Benefits:

The potential benefits associated with your participation in our study include, but are not limited to:

- This information will be beneficial to your country of Sri Lanka
- It will help develop a sustainable wildlife health program
- It will aid in decreasing disease transmission and increase both public and wildlife health
- The information obtained in this study will also help other countries in creating a sustainable wildlife health program

Risks:

Potential risks associated with your participation may include, but are not limited to:

- Some questions may be uncomfortable
- The interview may be a bit lengthy

Further Questions or Concerns:

If you have any further question or concerns about anything regarding this study, feel free to contact myself or any of the other researchers on this project with the contact information provided above. This study has been approved by the Research Ethics Board of the University of Saskatchewan. If you have any questions regarding your rights as a participant you can contact them with the information provided below.

Research Ethics Office

1-306-966-2975

888- 966- 2975 (for out of town participants)

ethics.office@usask.ca

By signing below you are stating that you have read and understand all information provided in this document. You have addressed all questions or concerns with the researchers and have obtained valuable answers. Here on in, you are consenting to participating in the research project presented to you. You will receive a copy of this consent form for your own personal records.

Name of Participant

Researcher's Signature

Date